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DuPont

Pompton Lake
Acid Brook Delta Area
Revised Corrective Measures
Implementation Work Plan

DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

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Acronyms and Abbreviations

ABD	Acid Brook Delta
ACO	Administrative Consent Order
ADJ	water column monitoring station adjacent to the active remediation area
bgs	below ground surface
CMI WP	Corrective Measures Implementation Work Plan
COPC	constituent of potential concern
CRG	Corporate Remediation Group
CQAP	Construction Quality Assurance Plan
cy	cubic yard(s)
DGA	dense-graded aggregate
DuPont	E.I. du Pont de Nemours and Company
EPA	United States Environmental Protection Agency
ERA	Ecological Risk Assessment
HASP	Health and Safety Plan
Highlands Act	New Jersey Highlands Water Protection and Planning Act
HSWA	Hazardous and Solid Waste
LWD	large woody debris
mg/kg	milligram(s) per kilogram
mg/L	milligram(s) per liter
mg/m^3	milligram(s) per cubic meter
N.J.A.C.	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
NJPDES	New Jersey Pollutant Discharge Elimination System
NJRDCSRS	New Jersey Residential Direct Contact Soil Remediation Standards
NTU	Nephelometric Turbidity Unit

pcf	pound(s) per cubic foot
PFT	paint filter test
PIP	Public Involvement Plan
PLW	Pompton Lakes Works
PM_{10}	particulate matter less than 10 microns in diameter
PPE	personal protective equipment
psi	pounds per square inch
QAPP	Quality Assurance Project Plan
QEA	Quantitative Environmental Analysis, LLC
RAOs	Remedial Action Objectives
RASR/CMS	Remedial Action Selection Report/Corrective Measures Study
RCRA	Resource Conservation and Recovery Act
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
RTMM	real-time meter monitoring
SAV	submerged aquatic vegetation
SESCP	Soil Erosion and Sediment Control Plan
Sevenson	Sevenson Environmental Services, Inc.
SOC	substance of concern
SPLP	Synthetic Precipitation Leaching Procedure
TCLP	Toxicity Characterization Leaching Procedure
TMDL	Total Maximum Daily Load
TSS	total suspended solids
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
URS	URS Corporation
WST	Waste Stream Technology

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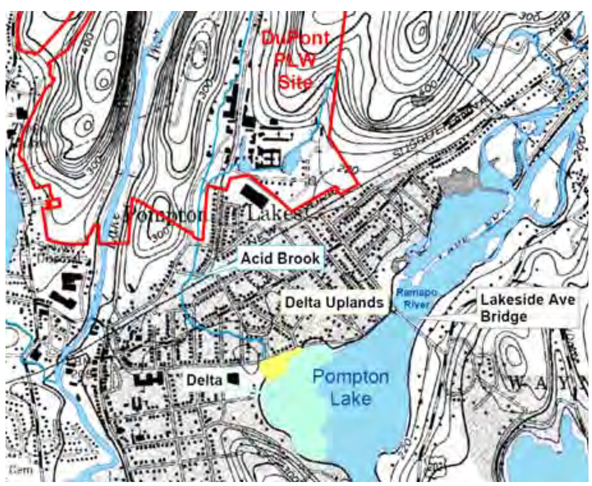
- ARCADIS, Syracuse, New York was the lead in developing the document, focusing on the sediment/soil remediation efforts.
- O'Brien and Gere, Syracuse, New York provided support on the monitoring program.
- Parsons, Gold Creek, Montana and Syracuse, New York developed the soil/sediment processing, transport, and disposition processes.
- URS Corporation, Ft. Washington, Pennsylvania provided the restoration approach and permit discussion.

Executive Summary

This Revised Corrective Measures Implementation Work Plan (CMI WP) presents the remedial approach to be implemented by E.I. du Pont de Nemours and Company (DuPont) in the Acid Brook Delta (ABD) Area to address impacts from historical operations at the former DuPont Pompton Lakes Works (PLW or site) located in Pompton Lakes, New Jersey. This document supercedes the December 2010 Revised CMI WP submittal as it has been updated on input received from the selected Remediation Contractor [Sevenson Environmental Services, Inc. (Sevenson)] and regulatory agencies.

DuPont is submitting this document to the regulatory agencies to provide information related to the equipment, processes, and methods to be used as part of remediation. Details regarding implementation of the remedial action were developed in coordination with Sevenson and are provided in Appendix F to this document.

The ABD Area includes the sediment in the area of the discharge of Acid Brook into Pompton Lake (termed the delta) and soils in upland (and wetland) areas located between Lakeside Avenue and the water's edge along the lake (see figure at right). Over the past two decades, extensive investigations have been completed to characterize the nature and extent of site-related constituents in sediments and soils including sampling, ecological investigations, scientific studies, and remedial investigations. Based on these efforts, delineation of constituents of potential concern (COPC) has been completed. The COPCs include mercury in the sediment within ABD and copper, lead, mercury, selenium, and zinc in the uplands soils. Note that the soils on the western shoreline adjacent to Pompton Lake south of Lenox Road and north of the Pompton Lake Dam are also included within the ABD Area; however, results of shoreline sampling indicated that the surface soils have not been impacted.



A Remedial Action Selection Report/Corrective Measures Study (RASR/CMS) was prepared to identify the remedial option for the ABD Area. The RASR/CMS included Remedial Action Objectives (RAOs) to achieve protection of human health and the environment and an evaluation of potential remedial measures, with removal selected as the preferred remedial approach. In October 2009, the NJDEP and United States Environmental Protection Agency (EPA) approved the RASR/CMS. Therefore, this document has been developed to present means and methodologies to be used when implementing the remedy approved in the RASR which included removal of sediment and soil from the ABD and surrounding uplands to achieve the RAOs.

Sediment will be removed from nearly 26 acres of the ABD, including materials that will likely be removed to create stable banks and side slopes in the work area. Additionally, soil will be removed from just over an acre of the uplands. The main steps required for sediment and soil remediation include: 1) installation of a containment system; 2) dredging and excavation; 3) transport and re-handling; 4) processing and solidification treatment; 5) material disposition; and 6) restoration.

The work area within ABD will be isolated from the rest of Pompton Lake using sheetpile and turbidity curtains to prevent those sediments resuspended during removal activities from being transported from the work area to the lake or Ramapo River. In the ABD, sediments will be removed "in the wet" using hydraulic dredge equipment. In the uplands floodplain, sheetpile will be installed along the shoreline and a series of erosion control measures will be put in place on land to contain materials disturbed during excavation. Soils from the uplands will be removed using excavation equipment operating from land.

Both sediments and uplands soils will be processed after removal. Soils removed from the uplands may be saturated with water and the moisture content may need to be reduced to meet disposition requirements. This will be accomplished through placing excavated materials in water-tight boxes and adding solidification agents as needed. Sediments from the ABD will be transported in a slurry from the hydraulic dredge to the shoreline via pipeline for processing through a dewatering system to separate the water and the solids. Following processing, the solidified impacted materials will be transported to an off-site licensed facility for final disposition. Trucking will be coordinated with the Pompton Lakes Police Department and Pompton Lakes School District so as to minimize impact to the community. Final approval of the trucking routes will be given by the Pompton Lakes Planning Board.

When the targeted sediments have been removed from the ABD, a granular layer of sand (termed an eco-layer) will be placed in the dredged area to establish a zone for benthic community recolonization over time. Also, planting and seeding of desirable aquatic native vegetation in the ABD will be performed. The plantings along with the sand layer will expedite restoration and increase the ecological functions of both the aquatic and benthic habitats. When excavation in the uplands and adjacent wetlands is complete, the area will be restored in accordance with the permit and restoration plan which includes appropriate plantings, park amenities, and pathways for public use.

A series of monitoring activities will be carried out before work begins to establish baseline conditions, and monitoring will be performed during excavation, dredging, material handling and processing, and eco-layer placement activities to assess the potential impacts of the remedial activities. Surface water monitoring will be performed both upstream and downstream of the active work area during working hours for dredging and eco-layer placement; air samples will be collected during working hours for excavation, dredging, and material handling and processing; and vibration monitoring of garage and house structures within 100 feet of the active sheetpile installation will be conducted. Action levels will be established for each monitoring component, and corrective action steps – ranging from conducting visual inspections to collecting additional samples to modifying construction methods – will be carried out as appropriate.

A comprehensive schedule for the project was developed in coordination with Sevenson. The soil and sediment removal portions of the project can be completed within 1 year. Restoration activities can be completed within approximately 6 months after the removal program is finished pending seasonal constraints for plantings. Pending receipt of Federal, State, and Local permits the dredging and soil excavation are anticipated to occur in 2012 along with some of the restoration. Because of the growing season, restoration activities will extend into mid-2013. Throughout the rest of the planning process and into active construction, DuPont will communicate with the regulatory agencies, stakeholders, and community regarding the status of the remedial efforts through meetings, the information outreach office, existing website, news releases, and fact sheets.

1. Introduction

This Revised Corrective Measures Implementation Work Plan (CMI WP) presents the remedial approach to be implemented by E.I. du Pont de Nemours and Company (DuPont) in the Acid Brook Delta (ABD) Area to address impacts from historical operations at the former DuPont Pompton Lakes Works (PLW or site) located in Pompton Lakes, New Jersey (Figure 1-1). This approach was initially provided in the CMI WP (ARCADIS et al., June 2010), but has since been updated based on results from the spring and fall 2010 investigation activities, responses to comments from the New Jersey Department of Environmental Protection (NJDEP), and input received from the selected Remediation Contractor [Sevenson Environmental Services, Inc. (Sevenson)] and regulatory agencies. This document supercedes the December 2010 CMI WP submittal.

The remedial approach for the ABD Area was determined based on the evaluations contained in the Acid Brook Delta Area Remedial Action Selection Report/Corrective Measures Study (RASR/CMS; DuPont Corporate Remediation Group [CRG], September 2009) which was subsequently approved by NJDEP and the United States Environmental Protection Agency (EPA) on October 22, 2009. Per the approved RASR/CMS, the selected remedial approach for the ABD Area is removal (Alternative 4).

The ABD Area includes three general areas – the portion in Pompton Lake (i.e., lake sediments) termed the delta, the uplands portion defined as the soils between Lakeside Avenue and the water's edge along the lake (including wetland areas), and the shoreline soils adjacent to Pompton Lake south of Lakeside Avenue Bridge and north of the Pompton Lake Dam (Figures 1-1, 1-2, and 1-3). The ABD lake sediments include a portion of Pompton Lake south of the Lakeside Avenue Bridge, east of the discharge point of Acid Brook into Pompton Lake, and west of the centerline of the former Ramapo River channel as defined by the 2007 bathymetric survey of Pompton Lake.

The ABD Area does not include the area of Pompton Lake north of the Lakeside Avenue Bridge, the area south of the Lakeside Avenue Bridge east of the centerline of the Ramapo River channel, or the lower Ramapo River channel. It should be noted that the RASR/CMS also considered two additional sediment areas located within the lower Ramapo River channel upstream of the dam. These two areas (termed Areas A and B) have been further investigated. The data indicated that either mercury levels are low or several feet of sediment not impacted by mercury are currently present at the surface.

DuPont is submitting this document to provide the approach and details for the remediation of soil and sediment in the ABD Area that has been impacted as a result of operations at the former PLW. The purpose of this document is to provide stakeholders with available information related to the equipment, processes, and methods to be used as part of remediation. The remedial approach outlined in this document has been developed based on data collected through November 2010. Additional details regarding implementation of the remedial action are provided in Sevenson's Operations Plan (Appendix F).

In January 2010, EPA assumed the regulatory lead for remedial efforts at the ABD Area, with continued involvement and coordination with NJDEP who was the former lead agency. Prior to January 2010, EPA review comments were directed to NJDEP. As such, this document has been prepared in general accordance with EPA's Corrective Action Plan (EPA, May 1994).

1.1 Purpose

The purpose of this document is to present the means and methods to implement the remedial approach for uplands soil and ABD sediments. Remediation will be performed to meet the Remedial Action Objectives (RAOs) established in the RASR/CMS (DuPont CRG, September 2009) for both the uplands soil and the ABD sediments to protect human health and the environment.

The medium of concern and primary constituent of potential concern (COPC) is mercury-containing sediment in the area of the discharge of Acid Brook into Pompton Lake. For the uplands, the medium of concern and primary COPCs are soils containing copper, lead, mercury, selenium, and/or zinc.

1.2 Background Information

The former PLW started operations in the early 1900s in the Eastern and Western Manufacturing Valleys. Manufacturing operations ceased in 1994 and the facility was dismantled over a several year period following closure.

DuPont entered into an Administrative Consent Order (ACO) with NJDEP in 1988 for the PLW. DuPont was then issued a Hazardous and Solid Waste (HSWA) permit in 1992 by EPA. The ACO and HSWA permit (subsequently revised in 1996) required DuPont to conduct a remedial investigation and delineate the extent of contamination at/or emanating from the PLW.

Starting in 1990, DuPont performed numerous investigations at the PLW, Acid Brook, ABD, and uplands to identify the type and extent of contamination. Results from these investigation activities were then used as the basis for implementation of a number of on- and off-site remedial activities directed at protecting human health and the environment. On-site activities included stabilization through installation and operation of a groundwater treatment system to contain and treat the on-site groundwater volatile organic compound plume, and completion of approximately 25 soil remedial and interim remedial activities. Extensive off-site soil cleanup and groundwater monitoring have also been performed. Acid Brook was remediated between 1991 and 1997 through stream-bed cleaning and excavation of adjacent floodplain soils.

1.3 Previous Investigations/Reports

Numerous investigations have been conducted within the ABD and uplands resulting in the collection of over 600 samples in both the ABD and uplands since 1990. The sections below summarize these investigation efforts, results, and conclusions.

1.3.1 ABD RIR

Investigations were conducted in the ABD to delineate the extent of mercury within the sediment in Pompton Lake. These investigations and results are documented in the Revised Acid Brook Delta Remedial Investigation Report (ABD RIR; DuPont CRG, January 2008). As part of these investigation efforts, ABD was divided into two areas – the area within the 800-foot radius line and the area outside of the 800-foot radius line (Figure 1-3).

A total of 68 locations were cored within the 800-foot radius in 2003. Samples were collected from the surface (0 to 0.5 foot) and submitted for analysis of total mercury. Samples were also collected for Toxicity Characteristic Leaching Procedure (TCLP) metals, Synthetic Precipitation Leaching Procedure (SPLP) metals, and geotechnical properties. Results from the total mercury analyses are summarized below. TCLP and SPLP analyses were conducted to determine the leachability of the metals, and results are provided in the Acid Brook Delta Sediment Reuse Plan (DuPont CRG, November 2005). Geotechnical data were obtained to evaluate possible construction considerations. The results for the geotechnical analyses are provided in Appendix D of the ABD RIR.

Delineation cores were also collected from 2004 through 2007 along several transects radiating outward from the 800-foot radius and along east, west, and north shore transects (total of 15 transects). Samples were collected for mercury analysis in the surface (0 to 0.5 foot) and subsurface (0.5 foot to bottom of sediment layer). If the sampled sediment thickness was more than 2 feet, a 0.5-foot sample was also collected from the intermediate interval. Delineation was considered complete when two consecutive sediment sample results along each transect (at a given depth) were less than or equal to 2 milligrams per kilogram (mg/kg) mercury. The results of the total mercury analyses in sediment are summarized on Figure 1-4.

Based on the data collection efforts and evaluation presented in the ABD RIR, mercury has been delineated to 2 mg/kg in Pompton Lake sediments. The conclusions of the sediment sampling as detailed in the ABD RIR are as follows:

- Sediment thickness ranges from 0 to 5.2 feet. Sediment thickness, although variable, generally was less than 2 feet. Sediment was often, but not always, underlain by peat.

- Water depth ranges from less than 1 foot near the mouth of Acid Brook to more than 18 feet near the dam.

- Mercury concentrations generally decrease with distance from the mouth of Acid Brook.

- Average (115 mg/kg) and maximum (1,486 mg/kg) surface (0 to 0.5 foot) mercury concentrations within the 800-foot radius are higher than average (9.2 and 50.1 mg/kg) and maximum (367 and 754 mg/kg) surface and subsurface mercury concentrations outside the 800-foot radius.

- There are exceedances of both TCLP and SPLP criteria, but these are limited. Specifically, a total of 148 samples were collected for TCLP/SPLP analysis, with 4 samples failing TCLP testing for lead and 7 samples exceeding SPLP levels (1 for lead, mercury and arsenic, 4 for arsenic only [2 from the same location but different depths], 1 for lead and mercury, and 1 for mercury only). This translates to a passing rate of 95 percent – see the Acid Brook Delta Sediment Reuse Plan (DuPont CRG, November 2005) for additional details.

- In general, the distribution pattern of mercury in sediments is consistent with the physical parameters of the conceptual model.

Additional details regarding data collection efforts, results, and conclusions are provided in the ABD RIR (DuPont CRG, January 2008). In May 2008, NJDEP confirmed that mercury delineation in Pompton Lake was complete and approved the ABD RIR in June 2008.

1.3.2 Uplands RIR

Investigations were conducted in the uplands to delineate the horizontal and vertical extent of COPCs in soils. The results of these investigations are presented in the Remedial Investigation Report, Pompton Lake Uplands (Uplands RIR; Parsons, June 2010). The uplands were divided into five areas (Areas A through E) to delineate the vertical and horizontal extent of COPCs in soil. As per the approved ABD Uplands Remedial Investigation Work Plan (Uplands RIWP; DuPont CRG, January 2009), horizontal delineation in surface soils (0 to 0.5 feet) was based on the lower value of the NJDEP November 2009 Residential Direct Contact Soil Remediation Standards (NJRDCSRS) and ecological soil delineation criteria to allow protection for use of the uplands by humans and ecological receptors. The NJRDCSRS were used as the criteria for evaluating soil greater than 0.5 feet deep in the uplands and surface soils for the shoreline. Investigation activities were implemented in accordance with the approved Uplands RIWP, and delineation was completed in all areas. The results of the delta uplands delineation are shown in Figure 1-5.

Soil sampling within the floodplain was also conducted to determine whether historic flooding may have deposited sediments containing site-related metals onto the shoreline properties. A floodplain analysis was completed to identify the low lying areas near the lake. Samples were then collected from properties along the western shoreline adjacent to Pompton Lake south of Lenox Ave and north of the Pompton Lake Dam, and analyzed for lead and mercury for characterization purposes in accordance with the approved Uplands RIWP. The results of the shoreline sampling indicated that the surface soils have not been impacted by ABD sediment during flooding events. Results from this investigation are documented in the Uplands RIR.

1.3.3 Ecological Investigation

An ecological investigation and Ecological Risk Assessment (ERA) was conducted in two phases for ABD (PTI, January 1997; Exponent, 2003). A supplemental biological investigation was conducted in 2005 to support the ERA by providing a more current understanding regarding the health and condition of aquatic communities in the delta (DuPont CRG, November 2006). As presented in the RASR/CMS, for the various receptors evaluated within the ERA, none of the measures of benthic macroinvertebrate community structure evaluated on the delta corresponded with spatial patterns of sediment substances of concern (SOCs). Community characteristics appeared to be influenced primarily by habitat-related variables, rather than the SOCs present. A weight-of-evidence approach showed that sediment SOCs on the delta do not pose potential unacceptable risk to benthic macroinvertebrates on the delta. The 2005 investigation provided similar conclusions indicating that benthic community structure in the delta has not been altered by mercury concentrations in sediment. As part of the ERA, food-web modeling showed that methylmercury in water, sediment, and prey from Pompton Lake does not pose a potential unacceptable risk to three of the four avian receptors that were evaluated.

1.3.4 Pompton Lake Bathymetry

A bathymetric survey was conducted in 2007 on Pompton Lake south of the bridge in Oakland, New Jersey, extending down the Ramapo River channel to the dam (Figure 1-3). The 2007 survey provides the most current bathymetric information for the lake; this survey was compared against surveys performed in 1993 and 2003 to evaluate potential changes in sediment elevation. This comparison indicated that the top of sediment elevation generally seems to show very little change over the 14-year period. There were some minor increases in sediment thickness (approximately 0.2

foot); however, this may be a function of the increased resolution of the 2007 data rather than an actual change to the sediment thickness.

The mean depth of Pompton Lake is approximately 7 feet, with a maximum depth of approximately 25 feet (see Figure 1-3). The bathymetry of the lake is dominated by two major features: the original channel of the Ramapo River, which runs along the eastern shoreline of the lake at water depths greater than 6 to 8 feet; and a broad embayment along the central western shoreline, where water depths are generally less than 4 feet.

1.3.5 Remedial Action Selection Report/Corrective Measures Study

Multiple scientific studies and remedial investigations were performed in the ABD Area and the lower Ramapo River through 2008 that culminated in the submission of the RASR/CMS (DuPont CRG, September 2009). Additional details on the previous studies and investigations, including a discussion of the physical, geologic, and hydrologic settings for the ABD Area are provided in the Draft Remedial Action Proposal (DuPont CRG, November 2006), ABD RIR (DuPont CRG, January 2008), and Uplands RIR (Parsons, June 2010). DuPont prepared the RASR/CMS to evaluate potential remedial alternatives to address elevated mercury concentrations in the ABD Area to meet the established RAOs. The alternative selected in the RASR/CMS was Alternative 4 - Sediment Removal. EPA requested clarifications on the RASR/CMS in April 2010, and DuPont responded to this request with two reports – Evaluation of the Acid Brook Delta Ecological Investigation and the Onondaga Lake Baseline Risk Assessment (URS Corporation [URS], May 2010) and the Supplemental Technical Information Report (DuPont CRG, October 2010). EPA notified DuPont that the information provided in these reports satisfied their request (EPA, November 2010).

1.3.6 Corrective Measures Implementation Work Plan

The June 2010 CMI Work Plan provided the general remedial approach developed based on data collected through January 2009, along with a few samples collected in May/June 2010 within the uplands. This approach was also developed absent input from potential remediation contractors. NJDEP provided comments on the document in September 2010, and DuPont subsequently responded to these comments in November 2010. The December 2010 Revised CMI Work Plan incorporated these comments along with DuPont's responses and expanded upon the previous general remedial approach based on additional upland samples and potential remediation contractor input. This document builds upon the June and December 2010 submittals and includes specific input from the selected Remediation Contractor (Sevenson) on the remedial approach.

1.4 2010 Investigation Activities

Additional investigation activities and treatability testing were performed in spring and fall 2010 to obtain data to further refine the extent of remediation and the remedial components. Details on the sampling/testing efforts and results are presented in Appendices A through E. These activities are summarized below (along with a reference to the corresponding appendix).

- Characterization and vertical/horizontal delineation of mercury levels within ABD at select locations (spring 2010 effort; Appendix A)

- A geotechnical investigation to facilitate the design of the in-water containment systems and assess stability in the uplands (spring 2010 effort; Appendix B)

- Solidification/stabilization testing to evaluate the type and quantity of agents needed to process sediment for disposition (spring 2010 effort; Appendix C)

- Completion of the uplands soil delineation sampling to determine removal limits (spring 2010 results documented in the Uplands RIR [Parsons, June 2010] and fall 2010 results presented in Appendix D)

- Reconnaissance activities to review structures (e.g., retaining walls, docks, etc.) along the ABD shoreline (Appendix E)

The results from these investigations have been incorporated into this document. Also, note that Appendix C also includes results from treatability testing performed in 2008 and 2009 for purposes of completeness.

1.5 Conceptual Model

DuPont has conducted numerous investigations to identify the type and extent of contamination. The results of these investigations were presented in the ABD RIR (DuPont CRG, January 2008) and the Uplands RIR (Parsons, June 2010). A conceptual model has been formulated through integration and analysis of these data. This model is presented in the RASR/CMS (DuPont CRG, September 2009), and a summary of the principle elements is listed below.

- History: Pompton Lake (see Figure 1-1) is an impoundment that was created by damming the Ramapo River. The dam was constructed in 1858 and was enlarged in 1908. When the dam was enlarged, the area that is now the delta was submerged. The enlargement of the dam coincided approximately with the start of DuPont operations in the Acid Brook Valley.

- Geology/Hydrogeology: Water depth in the delta area ranges from less than 1 foot near the mouth of Acid Brook to approximately 12 feet on the southwest shore, west of the Ramapo River channel. ABD sediments range in thickness from 0 to 5.2 feet with an average thickness of 1.5 feet. The underlying peat ranges in thickness from 0 to 4.3 feet with an average thickness of 1.9 feet. Bathymetric surveys were performed approximately 14 years apart, the most recent in 2007. Generally, the top of sediment elevation seems to show very little change over this period. There appears to be some minor increase in sediment thickness; however, this may be a function of the increased resolution of the 2007 data rather than an actual increase in sediment thickness. Regardless, the variation is less than 0.2 feet.

- Media of Concern: The medium of concern for Pompton Lake is sediment in the ABD. For the uplands, soil is the primary medium of potential concern.

- ABD COPCs: Several site-related metals have been investigated as part of the delta investigations including lead, mercury, copper, selenium, barium, and zinc. Barium, copper, selenium, and zinc concentrations are below the current NJRDCSRS. In areas where lead is above the NJRDCSRS, the lead impacted area will be addressed by remediation of the co-located mercury impacted area. Copper, lead, mercury, and selenium are elevated relative to sediment screening values. All exhibit similar spatial distributions in that the highest concentrations are near-shore in the vicinity of Acid Brook discharge. Mercury is the sole COPC that methylates and, therefore, has the potential for bioaccumulation. Methylmercury was identified as a COPC in preliminary studies. It was, however, determined that methylmercury distribution was based primarily on location and not on the concentration of mercury in the sediment. Mercury is, therefore, the constituent driving the remediation both in areal extent and in depth and is the primary COPC. The highest mercury concentrations (greater than 100 mg/kg) were generally found in the delta near Acid Brook.

- Uplands COPCs: Barium, copper, lead, mercury, selenium, and zinc were identified as COPCs for either human health and/or ecological receptors in some areas of the uplands. Lead and mercury are the primary COPCs with detected concentrations above the NJRDCSRS.

- Potential Receptors: Humans may have direct contact with surface water and sediment during recreational activities. Recreational activities on the lake are restricted. Due to elevated levels of coliform and bacteria within the surface water, signs are posted that prohibit swimming and wading in the lake. There is also a state consumption advisory for fish due to mercury, polychlorinated biphenyls, chlordane, dioxin, and DDX (NJDEP, 2008). Current uses of the lake include boating and fishing. However, potential exposure to sediment is minimal from these activities. It is expected that current use of the lake will continue into the future. Ecological receptors, aquatic species in particular, have direct contact with surface water and sediment. Both humans and ecological receptors may have direct contact with surficial soil and, to a lesser extent, subsurface soil. Surface water flow (i.e., rainfall) may potentially transport soil containing COPCs, with the majority of surface water runoff going to Pompton Lake. Therefore, the focus on risk management for sediment will be on the potential concern for ecological receptors. However, as presented in the RASR/CMS for ABD, both the triad weight-of-evidence and ERA (Exponent, 2003) indicated that the potential for unacceptable risk for the delta is minimal.

1.6 Remedial Action Overview

Based on the approved RASR/CMS (DuPont CRG, September 2009), the selected remedial approach for the ABD Area is to remove sediment/soil to achieve the RAOs. This section briefly outlines the components of the remedial approach; additional details are provided in Section 2.

Soil from the uplands area and sediment from ABD have been identified for removal through excavation and dredging (Figures 1-2 and 1-3). This section briefly outlines the components of the remediation. Six main steps are required for the remediation of soil and sediment, including:

- Installation of a containment system
- Dredging and excavation
- Transport and re-handling
- Processing and solidification treatment
- Material Disposition
- Restoration

Installation of a Containment System: A containment system consisting of sheetpile and turbidity curtains will be installed around the ABD to provide an engineering control to protect the surrounding water from resuspended sediment that may be generated during dredging activities. The system will enclose the removal area, and will be put in place prior to the removal activities. The uplands removal area will be isolated with control measures to reduce the potential for erosion or washout from disturbed areas to uncontained areas of the ABD or other areas within the uplands.

Dredging and Excavation: Removal activities within the ABD and uplands will be performed using hydraulic dredging and excavation equipment, respectively.

Transport and Re-handling: The dredged sediment will be slurried and pumped to the shoreline, where the sediment and water will be processed. Uplands soils will be trucked to the processing area.

Solidification Treatment: Excavated materials will be dewatered and solidified as required to meet disposition requirements. Sediment in the ABD is a very soft, fine-grained material with very low strength, and may require solidification prior to transport and disposition. Solidification will be performed through a mechanical dewatering and processing operation. The uplands soils are typical of conventional earthwork projects and may not require any solidification. As necessary, upland soils will be processed in water-tight containment boxes.

Material Disposition: After any necessary solidification treatment, the impacted sediment and soils will be transported to an off-site licensed facility.

Restoration: Following removal, the uplands will be restored by regrading to accommodate the restoration elements, planting with native vegetation, and placement of park amenities and pathways for public use. For the ABD, the dredged area will be restored by placing a granular layer of sand (i.e., eco-layer) over the dredged area to establish a zone for benthic community recolonization over time. Also, planting and seeding of desirable aquatic native vegetation in the ABD will be included. The plantings along with the sand layer will expedite restoration and increase the ecological functions of both the aquatic and benthic habitats. When excavation in the uplands and adjacent wetlands is complete, the area will be restored in accordance with the permit and restoration plan which includes appropriate plantings, park amenities, and pathways for public use.

Water column monitoring will be performed during dredging and eco-layer placement activities within ABD, air monitoring will be conducted during excavation, dredging, and material handling and processing activities, and vibration monitoring will be conducted for garages and houses within 100 feet of the active sheetpile operation.

Additional details regarding the tasks to be completed, equipment to be utilized, and actual operations and procedures to be implemented by Sevenson to perform each of these six main components are provided in the Operations Plan (Appendix F).

1.7 Public Involvement Plan

DuPont has developed a Public Involvement Plan (PIP) to identify additional approaches that DuPont PLW intends to implement in order to maintain open, transparent, timely, and consistent communications with residents of the Pompton Lakes, New Jersey community and other internal and external stakeholders during implementation of this CMI WP and related activities.

Overarching Goals

- Maintain an open and honest communication process
- Provide information to external audiences about safe remediation efforts
- Maintain the required level of environmental compliance during all remediation efforts
- Foster support among key stakeholders through coordinated communications and community outreach efforts
- Ensure effective communication on evolving issues, opportunities, and challenges that may potentially affect planned projects and activities

Public Participation Activities

DuPont will conduct activities and develop communications tools to provide timely dissemination of information to the public and encourage ongoing, two-way communication between PLW and external stakeholders. The following are general descriptions of community involvement activities. Additional activities/measures may be implemented to support specific project goals.

Meetings: As appropriate, PLW will communicate in a variety of forums, including:

- Community meetings (DuPont presented information regarding this project during the June 2011 CAG meeting in Pompton Lakes)
- Briefings for local, state, and federal elected officials

- Meetings with citizens and groups

- Educational/informational sessions (DuPont developed and staffed a poster session regarding this project for the Pompton Lake community in July 2011)

Information Outreach Office: DuPont operates the Pompton Lakes Works Remediation Project Office in downtown Pompton Lakes. The office supports continuing outreach activities concerning environmental remediation work related to former manufacturing operations at the PLW. The center houses information materials and documents relevant to the ABD project.

Website: PLW will continue to maintain and update the project's public web site (www.pomptonlakesworks.com).

News Releases: PLW will issue news releases and/or community advisories to announce public meetings and pertinent site related information.

Fact Sheets: PLW will prepare fact sheets as needed. These fact sheets will be available to all internal and external stakeholders as well as posted on the PLW public website.

1.8 Document Organization

The remainder of this document is organized into five sections. Section 2 presents the remedial approach. Specifically, Section 2 describes RAOs, pre-construction activities, preparation and access, uplands soil and ABD sediment removal activities, processing and disposition operations, monitoring program, restoration, contingency measures, and demobilization. A listing of permits and other necessary approvals to conduct the identified remedial approach is provided in Section 3, while Section 4 provides the general project schedule and anticipated project management structure. Section 5 lists references cited as sources for this document.

2. Remedial Action for the Uplands and Acid Brook Delta

This section describes the approach for the activities to be conducted for the remediation of soils and sediment in the uplands and ABD. As indicated in Section 1 and discussed further below, the methods used to implement the work (e.g., work area isolation methods, specific soil and sediment removal methods, sediment/soil processing, etc.) have been determined in consultation the selected Remediation Contractor (Sevenson). Additional details regarding the remediation methods including tasks to be completed, equipment to be utilized, and actual operations and procedures to be implemented by Sevenson are also documented in the Operations Plan (Appendix F).

The RAOs are presented in Section 2.1, and descriptions of the components of the remedial action approach are provided in Sections 2.2 through 2.10. Section 2.11 summarizes the completion report components.

2.1 Remedial Action Objectives

RAOs were developed in the RASR/CMS (DuPont CRG, September 2009) as long-term, media-specific goals aimed at protecting human health and the environment. RAOs were used to assist in selecting a remedial alternative to address elevated mercury concentrations in sediment and various metals in the uplands soils.

As stated in the RASR/CMS, RAOs are selected to address potential unacceptable risks associated with conditions and the exposure pathways identified. However, for the ABD, both the triad weight-of-evidence and ERA indicated that the potential for unacceptable risk is minimal. In addition, there are no promulgated applicable remediation standards for sediment to define quantitative RAOs (DuPont CRG, September 2009). Therefore, rather than developing a quantitative RAO or a remediation standard based on existing triad data, DuPont developed qualitative RAOs to minimize potential exposure of ecological receptors to mercury from sediments. Quantitative RAOs were developed for the uplands soils. The RAOs are listed below, and additional details on these RAOs are presented in the approved RASR/CMS (DuPont CRG, September 2009).

Sediment RAOs

The qualitative sediment RAOs for ABD are:

- Reduce the potential for mercury methylation in the near-shore sediments.
- Reduce the area of exposure of ecological receptors to elevated mercury concentrations in ABD sediments.

As discussed in the RASR/CMS, to facilitate application of the RAOs, volume-weighted spatial averaging evaluations were employed to characterize the extent of mercury concentrations in Pompton Lake sediment. Spatial averaging is a geostatistical data evaluation technique used to distribute discrete data over large areas, thereby attributing data to the entire study area rather than just to sample locations. This technique was used for the 0 to 0.5-foot interval (shallow interval) as well as the interval between 0.5 feet and the bottom of the sediment layer (deep interval).

Based on these RAOs, the extent of the area to be addressed during remediation has been defined and approved as part of the RASR/CMS. Addressing the area and achieving the RAOs presented above would result in the removal of at least 90 percent of the total mercury-impacted sediment in the shallow and deep intervals in ABD.

Soil RAOs

For uplands soils, both human health and ecological criteria have been selected as the RAOs (DuPont CRG, January 2009). In surface soils (0 to 0.5 foot), the RAOs will be based on the lower value of the NJRDCSRS and ecological soil delineation criteria as listed in Table 2-1 below. The methodology and supporting calculations for the derivation of ecological soil criteria are provided in Appendix C of the ABD Uplands RIWP. As discussed in the Baseline Ecological Evaluation (DuPont CRG, January 2009), the limited size, fragmented habitat, and frequent disturbance of the uplands area limits its value as an ecological habitat. Using the lower value of the NJRDCSRS and ecological soil delineation criteria will allow protection for both use of the uplands by humans, while also providing adequate protection for ecological receptors.

In subsurface soils (deeper than 0.5 foot), the RAO will be the NJRDCSRS. As such, the criteria for the COPCs considered in establishing the RAOs for the uplands area are provided in Table 2-1.

Table 2-1: Uplands RAOs and Removal Criteria

Analyte	Surface Soil Criteria (mg/kg)	Subsurface Soil Criteria (mg/kg)
Copper (Cu)	1,100	3,100
Mercury (Hg)	20.5	23
Lead (Pb)	400	400
Selenium (Se)	5.05	390
Zinc (Zn)	1,507	23,000

Therefore, to achieve the RAOs, uplands soils with COPCs exceeding the applicable criteria will be removed.

2.2 Pre-Construction Activities

DuPont has selected Sevenson to complete the remediation and construction activities. Since selection, Sevenson has collaborated with DuPont to refine the remedial approach, and has also developed an Operations Plan (Appendix F) that outlines further details on the construction activities to be implemented. Sevenson has also prepared a Contingency Plan (Appendix G) that provides the procedures for responding to emergency conditions or events that may occur during the performance of the remedial action activities. Additionally, in consultation with DuPont, Sevenson will provide other pre-mobilization submittals, including a Health and Safety Plan (HASP), Soil Conservation District approved Soil Erosion and Sediment Control Plan (SESCP), and permits.

The HASP will identify the project-specific health and safety procedures and will present information such as training certification, environmental and personnel monitoring, hazards and associated controls, work zones, identification of key personnel, standard operating procedures, and safety programs. The SESCP will outline the erosion and sediment control measures to be implemented prior to the initiation of removal activities.

Those local and state construction-related permits (e.g., storm water and sediment erosion control, electrical, and sanitary) required for the project will be identified and obtained. Additional details are provided in Section 3.

In addition to the pre-mobilization document submittals specified above, pre-construction activities will also include establishment of survey control and an inventory to document pre-construction conditions, as necessary. Survey control points and benchmarks will be established at the start of the work (including field verification of the existing ground surface elevation) and maintained throughout the construction activities to enable appropriate horizontal and vertical control consistent with the existing survey data. Sevenson will use such benchmarks to verify that the horizontal and vertical limits of removal have been obtained and that final surface grades have been achieved.

Prior to initiation of construction, an inventory will be performed to document the number, types, and locations of facilities within Rotary Park and Lakeside Park (e.g., structures, pavement, benches) and other physical features (e.g., trees, fences) that may be affected by or interfere with implementation of the remedial action. As necessary, these features may be protected or removed for the duration of remedial activities.

2.3 Preparation and Access

Various preparation activities and control measures will be implemented prior to and/or during remedial construction to limit potential construction impacts on the surrounding areas. These likely include establishing security and traffic control, implementing noise controls (as appropriate), identifying and relocating (as necessary) aboveground and underground utilities, installing erosion and stormwater control measures, accessing and establishing appropriate material and equipment staging areas, and clearing activities. These items are discussed in further detail below.

Security and Traffic Control

Site security will be established during initial mobilization to the site, and will be continuously maintained during the non-working hours until demobilization activities are complete. Appropriate temporary fencing will be installed to restrict access to active areas and protect monitoring and construction equipment. Traffic control (e.g., signage, flag person) will be provided as necessary, where construction activities may interfere with normal vehicle or pedestrian traffic in the vicinity of the work area. It is also important to note that, when school is in session, coordination will also be required with the local schools to avoid transport of materials and other construction-related traffic during certain morning and afternoon hours (i.e., from 7:30 a.m. to 8:30 a.m. and 2:30 p.m. to 3:30 p.m.) and minimize interference with school-related traffic.

Noise Controls

Sevenson will take adequate measures to keep noise at safe and tolerant levels. Noise controls will be implemented as necessary to mitigate the potential impact on the community due to construction activities.

Management of Existing Utilities

Aboveground (e.g., overhead power lines) and underground utilities (e.g., gas, storm sewer, water, electric lines) that could potentially be affected by the construction activities will be identified prior to and during mobilization. Sevenson will coordinate with New Jersey One Call (800-272-1000 or 811) to determine the locations of utilities at the start of work and coordinate with the owners of the utilities regarding the relocation/termination of utilities, as required.

Erosion and Stormwater Control Measures

Prior to the initiation of removal activities, stormwater controls, erosion prevention measures, and sediment control measures will be implemented. The design will establish the erosion and sediment control measures in accordance with applicable local and state regulations, permits, and SESCP.

Erosion control measures (e.g., silt fencing, hay bales, diversion berms) will be implemented in association with the active construction areas. Erosion controls will be installed as needed to mitigate the potential for erosion or washout from disturbed areas, as well as to divert rainfall or surface water runoff from work areas and open excavations. Storm sewer outfalls that may be present in the work areas will be located and managed as needed.

Access for Mobilization of Equipment

The uplands area and Rotary Park will be used as an access point for the equipment and materials associated with the uplands activities. This area will also be used for staging of equipment and materials during ABD Area operations.

Two locations have been identified as access points for mobilization and/or demobilization of water-based equipment and materials to Pompton Lake. The public boat launch at Lakeside Park (located east of Rotary Park) will be used for marine equipment and materials associated with the in-water containment system (Figure 2-2) at the start of the project. A temporary water access point will be established by Sevenson adjacent to the uplands access/staging area once the ABD containment system is in place. This access point will be used for the hydraulic dredge and associated equipment.

Establishing Appropriate Material and Equipment Staging Areas

As shown on Figure 2-2, the uplands and Rotary Park will be used for material and equipment staging once the ABD Area has been isolated. Generally, Rotary Park will be used for equipment staging during mobilization and load out of stabilized upland materials. The non-maintained park area will be used for staging the mechanical dewatering equipment to support ABD dredging operations following removal of the targeted uplands soils. The planned configuration for the upland area will include a visual screen, access gates and roads, asphalt material pads and associated equipment, and access ramps.

Clearing

To facilitate access to ABD and the uplands for implementation of remedial activities, land and shoreline areas will require clearing and grubbing (e.g., trimming and/or removal) of the heavy underbrush and trees. The clearing activities will also assist in reducing potential safety hazards during operations. Where practicable, areas that will not be needed for general operations activities will be left undisturbed. In keeping with restoration efforts, invasive tree species will be removed as part of the clearing and grubbing efforts. The major areas to be cleared include heavy shrub and trees from the area surrounding Acid Brook, Rotary Park, and along the neighboring shoreline located adjacent to Lakeside Avenue. Some limited clearing activities may also be required within the existing boat launch area.

2.4 Uplands Soils Remediation

As outlined in Sections 1.3 and 1.4, a number of soil samples have been collected at locations and depths necessary to horizontally and vertically delineate the limit and depth of removal within the uplands area. This section presents an overview of the approach to be used for the remediation of the uplands soils. Soil will be removed in the uplands to achieve the soil RAOs (i.e., criteria listed in Table 2-1) followed by restoration activities. Additional details regarding tasks to be performed, equipment and procedures to be utilized, and a discussion of the actual operations necessary to complete the uplands soil remediation are provided in the Operations Plan (Appendix F) prepared by Sevenson.

2.4.1 Acid Brook Flow, Sewers, Outfalls, and Groundwater Management

Acid Brook flows through the uplands soils remediation area, as shown on Figure 2-1, with an average base flow of approximately 0.71 cubic feet per second. During remedial activities in the uplands and ABD, Acid Brook flow will be managed through developing a collection sump at the upstream end of the uplands removal area and installing a sand bag/stone dam across the face of the brook to intercept flow. Ponded water will then be pumped through pipes that will discharge into the lake. Once the area within Acid Brook has been remediated, active pumping will be discontinued and instead gravity flow through pipes will be used to transport the water to the lake.

Two sanitary sewers cross under the bed of Acid Brook in vicinity of Lakeside Avenue. The depth of remedial excavation will likely expose these sewer lines. Sevenson will protect these lines during the removal action. Stormwater outfall headwalls, pipes, and energy dissipation structures will be reconstructed, as necessary, following removal action.

Certain uplands soils may be excavated to depths below the typical groundwater elevation and/or are in close proximity to the shoreline of Pompton Lake (e.g., Areas B, B2, C, C1, D1 through D3, E1, and E4 through E6 as shown on Figure 2-1). Actions will be implemented to limit the infiltration of groundwater and/or surface water to the individual excavation areas as determined necessary.

2.4.2 Uplands Work Area Isolation and Erosion Control Measures

During removal activities in the uplands, erosion control measures will be implemented in the active construction areas as necessary. The erosion controls will be installed as needed to mitigate the potential for erosion or washout from disturbed areas. Similar measures will be used as needed to divert rainfall or surface water runoff from entering work areas and open excavations.

In addition, sheetpile will be installed along the approximate boundary between the uplands and ABD to mitigate infiltration of surface water from Pompton

Lake into the active uplands removal areas, as shown on Figure 2-1. The sheetpile will be placed using a vibratory hammer attached to a backhoe. This barrier will also provide stability for the work and processing area to be established. An access road will also be constructed along the perimeter of this sheetpile. Three-sided sheetpile will be used to isolate certain remote removal areas (i.e., Areas E-5 and E-6) and mitigate the flow of surface water from the lake into the soils designated for removal from these areas. Sheeting will be installed from land in a "U" shape around these areas.

Erosion and sediment control practices will remain in place throughout construction activities until they are no longer necessary. During construction, erosion and sediment control devices will be routinely inspected and maintained and/or adjusted as necessary based on changes in conditions and/or activities.

2.4.3 Limit and Depth of Uplands Soil Removal

The horizontal and vertical delineation within the uplands has been defined through the collection of numerous soil samples for chemical analysis, as described in Sections 1.3 and 1.4. The resulting delineation from these samples has been used to determine specific removal extents/depths required to achieve the soil RAOs. Seventeen areas over approximately 1 acre have been defined for removal (Figure 2-1). The horizontal extent of each removal area has been defined by perimeter samples (one sample every 60 linear feet on average), and the vertical extent has been determined by a bottom sample (one sample every 900 square feet; Figure 1-5). Removal depths generally range from 0.5 to 8.5 feet below ground surface (bgs). The current total in-situ estimated removal volume is 7,800 in-situ cubic yards (cy).

As indicated in Section 2.2, control points have been established to define the target removal extent within each area. Control points have been developed at the corners, vertices, and over an approximate 25-foot grid within the removal areas (Figure 2-1A). The horizontal extent is based on the perimeter sample locations. The vertical extent is based on the maximum depth at which the COPCs exceeded the RAOs in the bottom sample for each area. The corresponding depth of excavation will be subtracted from the existing ground surface elevation consistently at all control points to determine the removal elevation. It should be noted that field verification of the existing ground surface elevation will be performed by Sevenson during pre-construction activities.

The approximate removal area, depth, and in-situ volume for each of the areas are listed below in Table 2-2.

Table 2-2: Approximate Removal Area, Depth, and Volume for the Uplands Areas

Area	Approximate Removal Area (square feet)	Removal Depth (feet)	Approximate Removal Volume (in-situ cy)
A	3,250	3	360
B	10,980	4	1,630
B1	1,600	1	60
B2	400	6	90
C	1,980	5	365
C1	6,400	3	710
D1	160	8.5	50
D2	13,380	7	3,470
D3	5,750	4	850
E1A	310	1	10
E1B	310	4	45
E2	200	2	15
E3	200	1	10
E4	200	8	60
E5	100	6	25
E6	100	3.5	15
E7	200	0.5	5
Total:	45,520	---	7,770

Note: All areas, depths, and volume are approximate. The locations of all removal areas are presented on Figure 2-1.

2.4.4 Uplands Soil Removal Process

Prior to initiating activities for the areas subject to soil removal, the horizontal limits of removal will be surveyed and staked in the field, and the removal areas stripped of vegetation and/or cleared of debris as necessary. Vegetation cleared above grade (e.g., trees, bushes, and branches) or below grade (e.g., tree stumps, roots) will be broken into smaller pieces for either reuse during restoration or disposal as necessary. Soils will then be removed to the specific elevations defined in Section 2.4.3 using conventional construction equipment (i.e., backhoe with a long-stick) operating from land within the uplands area. The backhoe will stockpile the excavated soils within the uplands excavation areas to allow gravity drainage. Another backhoe will load the drained soils into trucks for transport to the processing area. Soil not passing paint filter test will be loaded into boxes for processing.

Monitoring will be performed during soil excavation activities to assess the impact of construction on the surrounding environment and community (e.g., air monitoring). Corrective action levels have been established and these levels must be achieved during all soil excavation activities (see Section 2.7 for additional details on monitoring activities, standards, and assessment actions).

As discussed above, the maximum depth of the planned excavations is 8.5 feet bgs. For deeper excavation areas (e.g., Areas D1, D2, and E4), Sevenson will cut back the slopes at a safe angle of repose to allow access to the area as outlined in the Operations Plan (Appendix F). Results of the geotechnical investigation efforts performed in 2010, as they relate to the remedial approach and assessing stability of the uplands soils, are presented in Appendix B.

Removal activities are anticipated to start in Area A moving to Area E7 and Area B, and then working east towards Area E6. During removal activities, Sevenson will record surveyed field measurements, coincident with the survey control points (Figures 2-1 and 2-1A), to verify that the target removal extent and elevations have been achieved for each excavation area as described in the Operations Plan (Appendix F). Removed soil materials will be transported for processing, management, and disposition.

TCLP/SPLP testing was performed to determine the leaching characteristics of the soil. Results indicated that two areas exceeded TCLP levels. These areas were delineated during the spring 2010 investigations. Soils in these areas will be treated to meet TCLP standard through an amendment injection system prior to being excavated.

Backfilling will be initiated as soon as practicable after completion and proper documentation of excavation activities. Excavations will be backfilled with common backfill (i.e., soil fill) obtained from an off-site source. Backfill material will be natural material, no greater than gravel in size to promote proper settlement, permeability, and compaction, and will meet the gradation provided below.

Sieve	Percent Passing
3 inch	100
No. 200	10-30

Backfill materials will be trucked to the site and spread/compacted with several passes of a bulldozer.

Note that following backfilling activities, the uplands will be used as a staging area during sediment removal from ABD. As such, once backfilling activities are complete, a geotextile will be laid down and fill material will be added to raise the uplands elevation to create a working surface for the mechanical dewatering equipment required for ABD dredging. The geotextile will delineate between the two zones of backfill material. Following dredging and demobilization of the dewatering equipment, this additional material will then be reused for the eco-layer.

Once remedial activities are completed within the ABD, the uplands area will be restored by installing the final surface layer (e.g., topsoil and seed, stone) or restoration features as discussed in Section 2.8.1.

2.4.5 Uplands Soil Removal Completion Confirmation

As discussed in Section 2.2, Sevenson will utilize a NJ licensed professional establish horizontal and vertical survey control points for each removal area. Sevenson will then excavate each targeted removal area to the specified elevation, with points verified through surveying following removal (Figures 2-1 and 2-1A). Removal completion confirmation surveying will be elevation-based, and the surveyed control points will be used to verify that the horizontal and vertical limits of removal have been achieved. DuPont may elect to utilize a third-party surveyor to verify the required elevations have been achieved within each removal area. Based on the extent of delineation sampling, post-removal confirmatory sampling and analysis will not be necessary following completion of excavation.

2.5 Acid Brook Delta Sediments Remediation

As outlined in Sections 1.3 and 1.4, numerous sediment samples have been collected at locations and depths necessary to horizontally and vertically delineate the limit and depth of removal within Pompton Lake. This section outlines the approach for the remediation of sediments in ABD (Figure 2-2) to achieve the sediment RAOs. Additional details regarding tasks to be performed, equipment and procedures to be utilized, and a discussion of the actual operations necessary to complete the ABD sediment remediation are provided in the Operations Plan (Appendix F) prepared by Sevenson.

2.5.1 ABD In-water Work Area Isolation

The ABD work area will be isolated using a containment system consisting of a sheetpile wall and turbidity curtains positioned around the exterior of the wall. Turbidity curtains will be installed prior to the sheetpile, and will be maintained for the duration of the dredging, eco-layer placement activities and both the installation and removal of the sheetpile. Additional turbidity curtains may be further utilized during sediment removal activities in order to assist in meeting compliance targets as needed.

The approximate location of the sheetpile is shown along the approximate boundary of the ABD removal area on Figure 2-2. This perimeter sheetpile will be offset 30 to 50 feet from the dredge area in non-targeted sediment.

It is currently anticipated that the top elevation of the sheetpile wall will be installed to a height approximately 2 to 3 feet above the mean water surface elevation. The majority of flow within Pompton Lake is associated with the Ramapo River and the only input to the area contained by the sheetpile wall will be from Acid Brook (flows within the brook are a small component of overall flow). However, as a precaution, the sheetpile wall will also be constructed with a window (set at the 100 year flood level elevation) to allow water to pass through this section. This will help mitigate high water events and the effect on water levels within the sheet pile area. Additional information and details on the sheetpile installation are provided in the Operations Plan (Appendix F). In the event of heavy rains or potential flooding scenarios, work will be halted and equipment will be secured within the area as necessary. Additional details regarding contingency measures associated with severe weather/flooding and overtopping of the sheetpile are included in the Contingency Plan (Appendix G).

Geotechnical borings were advanced in spring 2010 to obtain additional data regarding sub-surface material characteristics. Results of these efforts are provided in Appendix B. The results generally show that dense to very dense materials are found throughout the area. A detailed engineering evaluation using the spring 2010 data was performed by Sevenson to determine sheetpile installation methods and materials as provided in the Operations Plan (Appendix F).

The open water sheeting will be installed from the water using an excavator and backhoe equipped with a vibratory hammer located on flexi-float barge.

Another barge will be used to deliver sheeting to the installation area. To mitigate the potential effects of prop-wash on the impacted sediments, to the extent practicable, the equipment used to install the sheetpile will operate from the east side of the outer perimeter (i.e., outside of the removal area).

Once the sheetpile is installed, and prior to the initiation of sediment removal-related activities, an attempt will be made to capture and relocate fish and other large aquatic species from the containment area. This will primarily be performed using electrofishing equipment and supplemented using seine nets, trap nets, etc.

Access to the lake by residents in the areas where the sheetpile must be installed will be limited; DuPont will work with the residents to identify potential alternatives for access.

2.5.2 ABD Debris Removal

Based on previous sampling and field reconnaissance efforts, it is not anticipated that a separate step will be required for debris removal. If encountered, debris removal activities will be performed using an excavator equipped with a perforated bucket located on a flexi-float barge. Sevenson may also use a specialized rake and grapple depending on the nature of the debris encountered. Debris will be placed in a shallow-draft material scow for transport to the processing area using a work boat. Debris will be removed from the scow using a backhoe or crane and then handled as described under Section 2.6.1.

Dense submerged aquatic vegetation (SAV) has historically been observed in Pompton Lake during the summer growing season. This vegetation is currently managed by the Town of Pompton Lake by chemically treating it on an annual basis. Any SAV encountered will be removed using the hydraulic dredge and processed similar to other debris and material.

2.5.3 Limit and Depth of ABD Sediment Removal

As presented in the RASR/CMS and summarized in Sections 1.3 and 1.4, the horizontal and vertical extents of sediment removal have been delineated. The associated data from these samples have been used to determine specific removal extents/depths required to achieve the sediment RAOs. The horizontal extent of the ABD removal area is provided on Figure 2-2 and covers approximately 26 acres. The vertical extent of removal varies throughout the ABD has been defined by the removal depth required to achieve the sediment RAOs as determined through sampling. The sediment volume was estimated based on the sediment surface observed during the 2010 sampling locations, as well as the vertical delineation of mercury targeted for removal as indicated by the 2010 sampling results (note some historic sample locations were also included where 2010 samples were not collected to provide adequate coverage of the ABD). The resulting estimated volume is approximately 68,800 cy.

The actual volume to be removed will need to account for operational considerations such as allowances for sloping that may be necessary to stabilize deeper excavations and method of dredge operation (Palermo et al., 2008). To account for sloping and actual dredging operations, a dredge prism has been developed for the ABD removal area (Figure 2-3). The dredge prism includes at a minimum, the removal elevation defined by sampling and the RASR/CMS information. In addition, the dredge prism accounts for the general assumptions/boundary conditions listed below.

- A 1-foot vertical cut will be removed along the boundary of the sediment removal limit at the ABD shoreline, at which point the removal depth will be tapered at a 3H:1V slope (i.e., 3 horizontal:1 vertical), as necessary, to transition to the depth required to achieve the sediment RAOs.

- Along the sheetpile isolating the ABD removal area from the remainder of Pompton Lake, a vertical cut will be removed at the sediment removal area limit boundary, at which point the removal depth will be tapered at a 3H:1V slope outside of the sediment removal area limit, but within the sheetpile containment system, to transition to the existing grade.

- Along the sheetpile adjacent to the upland area, a vertical cut will be removed at the sheetpile to the depth required to achieve the sediment RAOs.

- The dredge prism has been designed with consideration for constructability (i.e., range of accuracy of dredging equipment, reasonable tolerances, etc.). As such, the dredge prism surface has been smoothed to allow for more gradual transitions between adjacent removal areas.

Overall, the resulting dredge prism provides the approximate areal extent and elevations that would need to be achieved during dredging activities and is used to determine the resulting removal volume. A series of cross-sections within the dredge prism is also presented on Figures 2-3A and 2-3B.

A summary of the anticipated removal volume based on these operational considerations is provided in Table 2-3 below.

Table 2-3: Approximate Removal Volume for ABD

Location	Removal Volume to Achieve RAOs (in-situ cy)	Dredge Prism Volume (in-situ cy)
ABD	68,800	75,000

Note: All volumes are approximate. The location of the removal area and dredge prism are presented on Figure 2-3.

A shoreline reconnaissance effort was performed in fall 2010 to locate and identify structures along the shoreline that may influence the removal extent/boundaries. These structures include docks, retaining walls, etc. as presented in Appendix E. It is anticipated that removal adjacent to these structures will be handled consistent with the shoreline (i.e., 1-foot vertical cut tapered at a 3H:1V slope). A more thorough evaluation of these structures and removal activities will be performed in coordination with DuPont, Sevenson, and the property owner.

2.5.4 ABD Sediment Removal Process and Sequencing

Prior to initiating dredging in ABD, the horizontal limits of removal will be surveyed and defined in the field using buoys or other acceptable markers. Sediments will be removed “in the wet” utilizing an 8-inch Moray hydraulic dredge (manufactured by Dredging Supply Company). This dredge is capable of removing 50 to 120 cubic yards per hour, and can be operated in relatively shallow water depths (2.75 feet) up to 17 feet, and also has the ability to dig its way into shallow water creating enough water depth to operate. Positioning of the dredge will be performed using a real-time kinematic global positioning system (RTK GPS) and Dredgepack system designed specifically for the hydraulic dredge. The proposed contour surface will be programmed into the Dredgepack system provide the operator with a real-time display of removal depths/elevations. The output from the RTK GPS and Dredgepack system will be used to verify that the target removal depths/elevations have been achieved.

Monitoring will be performed during dredging activities to assess the impact of construction on the surrounding environment and community (e.g., water column monitoring). Corrective action levels have been established and these levels must be achieved during all sediment excavation activities (see Section 2.7 for additional details on monitoring activities, standards, and assessment actions).

Sediment removed during the dredging process will be directly transported in a slurry via pipeline to the shore for processing.

Dredging will begin at the southeastern corner of the ABD area, with work generally progressing north and west. The Operations Plan (Appendix F) provides additional details on the dredge sequencing. Removal activities will be sequenced such that constituent-containing materials will not be transported over areas in which the eco-layer has been installed. To mitigate the potential effect of prop-wash on the impacted sediments, to the extent practicable, the dredge will operate from within areas already remediated.

In 2003, TCLP/SPLP testing was performed to determine the leaching characteristics of the sediment within the 800 foot area within ABD (Figure 1-3), and the results were summarized in the ABD Sediment Reuse Plan (DuPont CRG, November 2005). Results indicated four samples exceeded TCLP levels for lead. These areas were further delineated during the spring 2010 investigations. Sediments in these areas will be treated to meet TCLP standards through an amendment injection system and specialized mixing head attached to a hydraulic excavator on a flexi-float barge prior to being dredged.

2.5.5 ABD Sediment Removal Completion Confirmation

Removal completion confirmation will be elevation-based as defined by the dredge prism (Figure 2-3). Both traditional survey techniques (e.g., pole shots) and the dredge-mounted RTK GPS will be used by Sevenson to verify that the horizontal and vertical limits of removal have been achieved. It is anticipated that an approximate 50-foot by 50-foot grid will be used for survey confirmation efforts by a NJ licensed professional. DuPont may elect to perform an independent post-dredging survey to confirm the results of the survey performed by Sevenson. Based on the extent of delineation sampling, post-removal confirmatory sampling and analysis will not be necessary following completion of dredging.

2.5.6 In-situ ABD Post-Dredging Management

The dredged area will be covered with a layer of granular material that will be placed after dredging operations have been completed. This granular material will cover the dredge area and will also serve to establish a zone or "eco-layer" within which the benthic community can re-establish over time. Details on the eco-layer are provided in Section 2.8.2.

2.6 Sediment/Soil Processing and Disposition

Once the soils and sediment are excavated or dredged from ABD and the uplands as described in Sections 2.4 and 2.5, the materials will require further processing (e.g., transportation within the work area, particle separation and compression and solidification, conveyance for off-site disposition, etc.). A description of these processes is provided in the following sections.

2.6.1 Material Transport and Re-handling

Dredged sediments from ABD will be transported from the lake to land for treatment and disposition. Therefore, it will be necessary to establish a staging area to re-handle dredge materials prior to transport.

Staging Area

Figure 2-2 shows the space available for staging. The design of the staging area takes into account the difference in elevation between the elevation of Lakeside Avenue and the lake. The ground surface in the park and on Lakeside Avenue is fairly level, and the existing topographic maps show elevation contours from 206 to 208 feet. The ground surface on the west side of Acid Brook is lower and varies from about 202 to 205 feet.

The staging areas will use all available land space at the mouth of Acid Brook, as shown in Figure 2-2, to accommodate the equipment and other supporting materials and facilities associated with remedial activities. Solidification and particle separation and compression will be done at the lakeshore and the equipment will be located where the ground surface is lower, which provides the maximum distance between residential areas and the equipment. The area on the east side of Acid Brook will be used for truck staging and general support activities.

Transport and Re-handling

Sediment will be solidified and compressed for transport at the lakeshore which will reduce the number of vehicles needed to transport sediment for disposition versus solidification being conducted at an alternate location.

Debris is likely to be encountered during dredging operations. Debris may be natural material or man-made items. Large debris includes items such as logs or stumps greater than 6 inches in diameter, boat anchors, car or truck tires, steel cables or chains, broken concrete, etc. Large, non-porous materials may be cleaned and taken to an appropriate recycling facility. It is not practical to decontaminate porous debris, so it will be managed by cutting into smaller pieces with transport to the same off-site facility as the impacted sediment and soil. The specific methods of handling debris will be further refined during construction in consideration of the nature and characteristics of the debris materials and the overall sequence and schedule of the removal actions.

2.6.2 Solidification

Soils removed from the wetland area in the uplands may be saturated with water. The soils moisture content will likely need to be reduced to meet the off-site licensed facility's requirements. In general, there are two methods of sediment processing to reduce the moisture content of these excavated materials: passive gravity drainage or addition of solidification agents. It is expected that both methods will be used during construction. This will allow flexibility to perform the work in a cost-effective manner and still meet disposition requirements for moisture.

Sediment samples from ABD were used in bench-scale solidification testing. The purpose of the testing was to assess the effectiveness of various solidification agents. A description of the methods used and the results in presented in Appendix C. A summary of the testing and results is given in the following paragraphs.

Sediment from 18 subareas of the proposed dredge area was placed into 3.5 gallon containers and delivered to the laboratory. Composite samples were made from three areas of the near-surface, soft sediment and one from peat. Each composite was testing with cement, ground corn cobs, polymers from two suppliers, cement with $FeCl_2$ and Na_2S, cement with alum and cement with polymer.

- Samples treated with cement produced the highest strength index and lowest TCLP mercury and lead concentrations; but exhibited pH approaching 11 and the paint filter test (PFT) did not pass at the time of application.
    - Adding alum resulted in immediate passage of PFT and provided some attenuation of pH.
    - Adding $FeCl_2$ and Na_2S did not confer any significant advantage over cement alone.
- Samples treated with ground corn cobs passed PFT at the time of mixing, and had low TCLP mercury and lead concentrations, but resulted in low strength index and low unit weight. They were plagued by sediment expansion accompanied by a putrid odor possibly due to an adverse biochemical reaction.
- Sample treated with polymer passed PFT at the time of mixing and had neutral pH, but had low strength index, and the highest TCLP mercury and lead concentrations, which were below characteristic hazardous waste criteria.
- Samples treated with cement combined with polymer had low TCLP mercury and lead concentrations, but retained several disadvantages that characterized each agent separately.

After the results from testing on the composite samples were available, sediment from the subareas with the highest mercury and lead concentrations were tested with cement and one polymer.

- The three samples of soft sediment treated with 10 percent cement and 20 percent cement by wet weight failed PFT at the time of mixing and passed after one day of cure time. Sample treated with 20 percent cement had strength index values an order of magnitude higher than the 10 percent samples.
- Samples treated with 20 percent cement had low TCLP mercury and lead.

- The peat sample treated with 5 and 10 percent cement by weight passed PFT at the time of mixing.
- The peat sample with 10 percent cement had low TCLP mercury and lead.
- The four samples treated with polymer passed PFT at the time of mixing. TCLP mercury and lead were below regulatory criteria, but were higher than cement.

Soils from the upland area that are above the groundwater table are likely to meet the requirements for transport and disposition at the time of excavation. In this case, the soil would be loaded into trucks without any further treatment. Soils that do not dry sufficiently by passive drainage will be further treated by the addition of solidification agents within water-tight containment boxes to render the material acceptable to an off-site licensed facility.

2.6.3 Particle Separation and Compression

Since hydraulic dredging will be used, the dredged slurry will be transported by pipeline from the dredge to the lakeshore. In order to create a slurry that can be pumped with centrifugal pumps, the dredge adds lake water at the dredge head to create a slurry that has 5 to 15 percent solids by weight. As a result, the volume of slurry would be 3 to 5 times the in-situ volume of the soft sediment. Although it would be possible to transport the slurry in tank trucks to an intermediate site for particle separation and compression, this would increase truck traffic and increase the duration of the dredge work due to the volume and weight of slurry compared to the in-situ volume.[1]

Waste Stream Technology (WST) performed a treatability study to assess particle separation and compression technologies for sediment obtained from the ABD. The average percent solids of the sediment samples was 30.3 percent. Testing was done on two composite samples, and the average percent solids resulting from filter press tests was 56.0 and 55.1 percent at a pressure of 150 pounds per square inch (psi). WST tested for mercury in samples of the filtrate from the test, and the results were 0.5 and less than 0.2

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[1] For example, a typical dredge would generate 1,000 gallons of slurry per in-situ cubic yard, so that dredging 250 cubic yards would generate 250,000 gallons of slurry and require 42 tanker trucks.

µg/L (micrograms per liter), respectively. The filtered sample, using a 0.5-micron filter, contained a mercury concentration of less than 0.2 µg/L. In conclusion, WST reported that the treatability study indicated that pretreatment with polymer and dewatering by recessed chamber filter press technology would be an appropriate, effective, and cost efficient regimen for compression of sediments from the ABD.

Temporary particle separation and compression equipment will be set up on shore to compress the sediment slurry. For projects the size of ABD, trailer-mounted equipment is available that can be set up in a relatively small area. The process consists of screening to separate gravel and sand size particles, followed by polymer addition and mixing and then pumping the slurry into filter presses to compress the fine-grained sediment into a filter cake.

One advantage of hydraulic dredging with filter press compression is that the compressed sediment will be denser than in-situ, which will result in a significant reduction in the weight of sediment for transport and a reduction in the number of trucks required.[2] Another advantage is that hydraulic dredging and mechanical compression will have a higher production rate than mechanical dredging and solidification, which will reduce the duration of dredge work.

2.6.4 Material Disposition

The sediment that will be dredged from the ABD could be reused on the PLW property according to the NJDEP-approved Sediment Reuse Plan (DuPont CRG, November, 2005). However, DuPont has decided to process the impacted material (e.g., soil and sediment) and ship it to an off-site licensed facility for final disposition. The main criterion for off-site disposition is to pass the PFT for transport in standard trucks and placement in the licensed facility.

Sevenson will contract with licensed haulers to transport the sediment, soil, water, and other materials (e.g., debris, vegetation) in accordance with appropriate local, state, and federal regulations.

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[2] For example, one in-situ cubic yard of sediment with 30 percent solids content contains about 600 pounds of sediment particles and 1,400 pounds of water. When compressed to 55 percent solids by weight, there would be 600 pounds of sediment (no change) and 500 pounds of water, so the total weight would be reduced from 2,000 to 1,100 pounds.

Construction-derived debris, such as used liners, personal protective equipment (PPE), and decontamination wastewater, will be transported at an off-site licensed facility.

Decontamination of trucks that leave the site will be accomplished by dry methods whenever possible. Wheels and vehicle sides will be broom cleaned. Excavation equipment that enters the lake is not expected to leave the project area frequently. However, when equipment does leave, decontamination will be accomplished by power washing or appropriate methods.

2.7 Monitoring Program

Monitoring activities will be performed during excavation, dredging, material handling and processing, and eco-layer placement to assess potential impacts of the remedial action on the surrounding environment and community. Monitoring will be conducted during construction to obtain timely information on potential effects of the remedial activities. The types of monitoring expected to be performed are discussed in the following sections.

Water Column Monitoring

Water column monitoring will be performed during dredging and eco-layer placement construction work hours at fixed stations located upstream and downstream of the ABD. These stations will be established outside of the sheetpile to monitor for releases from the work areas during dredging and eco-layer placement operations. The locations of the fixed stations have been selected to be consistent with locations sampled during prior sampling events, as follows:

- The station at Doty Road (approximately 1 mile upstream of the Lakeside Avenue Bridge over the Ramapo River) to assess upstream turbidity levels, entering from the Ramapo River to the ABD.

- The station at SW9 to monitor downstream levels.

A fixed station will also be established adjacent to and outside the sheetpile/turbidity curtain system that bounds the active remediation area (ADJ), to serve as an early warning mechanism for potential concerns that may be observed at the SW9 downstream monitoring location.

The approximate locations of these stations are illustrated on Figure 2-2.

Water column monitoring will include the collection of continuous real-time turbidity readings using a floating monitoring system equipped with a buoy. Readings will be obtained at 0.5 times the total water column depth from the upstream, adjacent, and downstream stations. Real-time turbidity readings (e.g., readings obtained over consistent time intervals, such as every 15 minutes) will be collected in the field to provide immediate data on the solids within the water column. The corresponding turbidity corrective action levels for the downstream station (SW9) are:

- >25 and <50 Nephelometric Turbidity Units (NTUs) over upstream levels (Doty Road station): Early warning level – Two consecutive turbidity measurements (i.e., two consecutive time intervals, such as every 15 minutes) at this level will prompt visual inspection of current work areas.

- >50 NTUs over upstream levels: Corrective Action Level – Two consecutive turbidity measurements (i.e., two consecutive time intervals, such as every 15 minutes) at this level will result in a prompt evaluation of the probable cause and the collection of water column samples from all three stations with submittal of the samples for additional analysis such as total suspended solids (TSS) and dissolved mercury analysis.

Corrective action triggers for mercury and TSS, collected as part of the corrective action level, will also be established as follows:

- Detection of mercury at 1.4 µg/L (dissolved phase) at either downstream station. This level is the NJDEP aquatic-acute surface water quality standard for fresh water (http://www.state.nj.us/dep/wms/bwqsa/swqs.htm).

- Detection of TSS levels at either downstream water column station greater than 25 milligrams per liter (mg/L) over the level measured at the upstream station.

During remedial activities, water column analytical results will be requested from the laboratory on a quick turnaround-time schedule (e.g., 24 to 48 hours). If results exceed the corrective action trigger, a number of assessment activities may be initiated, potentially including the following:

- Review the ongoing dredging activities and modify the condition or performance of the existing erosion and sediment control measures and the turbidity barriers.
- Continue turbidity monitoring to determine if the elevated reading was possibly a short-duration event.
- Collect additional samples from various locations within or adjacent to the dredge area to possibly identify the potential source(s) of the elevated reading.

If these assessment activities indicate that the elevated monitoring results reflect a water quality impact that could persist or recur and that it is related to specific dredging activities or controls, the pertinent activities will be modified to the extent feasible, or additional controls may be implemented.

Samples will also be collected routinely collected once per week at each water column station for mercury and TSS to characterize water column levels throughout dredging and eco-layer placement activities.

Air Monitoring

Air monitoring will be performed during soil excavation and sediment handling and processing at upwind and downwind locations around the excavation and sediment handling/processing areas. Air monitoring will consist of continuous real-time monitoring for particulate (dust), verification sampling for particulate containing mercury, and continuous meteorological monitoring. The air monitoring activities outlined herein are not intended for use in establishing actions levels for workers, as this will be accomplished in accordance with Sevenson's HASP.

Particulate (Dust) Monitoring

Air monitoring activities will include continuous real-time monitoring for particulate matter less than 10 microns in diameter (PM_{10}), herein referred to as dust, during soil excavation and sediment handling and processing. It is anticipated that the dust monitor (used to measure PM_{10}) will be a Thermo Scientific Inc. ADR1500 or equivalent with a measurement range of 1 to 400,000 micrograms per cubic meter [$\mu g/m^3$] and resolution of 0.1 $\mu g/m^3$.

Dust monitoring will be conducted at one upwind and two downwind locations on a monitoring line between the excavation/sediment processing areas and the community as shown on Figure 2-2. The actual monitoring locations along the monitoring line will be selected each monitoring day using the forecast wind direction for that day. Locations that are upwind of the activity will measure dust levels coming into the processing area; these levels are referred to as background levels.

Data from the monitors will be telemetered via cellular modem to a central computer that will store the data and send alarms to the on-site technician. Alarms will alert the technician about changing dust levels and changing monitor performance. The technician will alert Sevenson to implement dust controls (described below) when dust concentrations reach the following corrective action levels:

- Control Level: If the downwind dust level is 100 µg/m^3 (based on 15-minute averages) above the upwind concentration, then dust controls will be implemented and air monitoring will continue.

- Work Perimeter Limit: If the downwind dust level is 150 µg/m^3 (based on 15-minute averages)[3] above the upwind concentration, then the operations attributable to the source of dust will be curtailed or modified until dust levels decrease below the control level.

Appropriate dust control measures may include the following:

- Spraying water on identified sources

- Hauling excavated materials and clean materials in properly tarped vehicles

- Restricting vehicle speeds

- Covering excavation faces after excavation activities cease for the day, if applicable

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[3] The dust limit is equivalent to the national ambient air quality standard for PM_{10} established by the EPA for one-hour averages.

In all instances, environmental conditions at the time of the exceedance will be investigated. It is possible that certain conditions (e.g., fog, high humidity, heavy precipitation, pollen, etc.) may influence the values recorded by the dust monitors. If environmental rather than operational conditions are determined to be the cause of the exceedance, the on-site technician will identify and record the cause of the exceedances and monitoring will continue.

Mercury Verification Sampling

Mercury verification sampling will be conducted during soil excavation and sediment handling and processing. The EPA Regional Screening Level (RSL) for inhalation of mercury for residential settings is 0.31 $\mu g/m^3$. A pre-design investigation was conducted to measure mercury emissions from ABD sediment samples. The investigation involved sampling of vaporous mercury from sediment placed in a flux chamber. Mercury vapor was not detected in the headspace above any of the six samples at levels above 0.1 $\mu g/m^3$. The investigation also used the sampling results and the highest (99^{th} percentile) mercury concentration in sediment to estimate the mercury concentration in ambient air at the work perimeter. The maximum concentration of vaporous mercury at the work perimeter was estimated to be 0.001 $\mu g/m^3$, which is well below the RSL of 0.31 $\mu g/m^3$.

Therefore, mercury in its vapor phase is not expected to be released during sediment processing and handling. Mercury in the ABD sediment is bound to the sediment and is not present in its volatile forms (such as elemental mercury). Therefore monitoring for particulate (dust), as described above, is warranted. Although the dust work perimeter limit, recommended above, is expected to also be a conservative limit for particulate-bound mercury concentrations at the work perimeters (based on the highest mercury concentration in sediment), sampling of mercury on particulate is being proposed for verification purposes.

To verify that particulate-bound mercury will be well below the RSL, a 24-hour integrated sample of particulate will be collected once per week for the first 8 weeks of soil excavation (approximately 3 weeks) and sediment handling and processing (approximately 5 weeks) at one location downwind of the excavation/processing areas and on the monitoring line shown on Figure 2-2. The sampling day per week will be selected such that the monitoring location is downwind of the excavation/processing areas (northeast wind direction) for all or part of the 24-hour sampling period. Samples will be collected using a high volume sampler for PM_{10}, in accordance with USEPA Method 40CFR 50,

Appendix J, and analyzed by graphite furnace atomic absorption spectroscopy in accordance with USEPA Method SW846-7471A. The anticipated method reporting limit is 0.001 µg/m^3.

Mercury sampling will terminate or continue based on the following decision process:

- If none of the mercury sample results from the first eight weeks of sampling are above 50 percent of the RSL, mercury sampling will terminate.

- If one or more of the mercury sample results from the first eight weeks of sampling are above 50 percent of the RSL, the conditions under which the result(s) is obtained will be identified and used in recommendations for additional sampling. A proposed plan will be submitted to USEPA for input and approval prior to additional sampling; it is anticipated that monitoring will continue as outlined here until USEPA approval is received.

Meteorological Monitoring

Concurrent meteorological monitoring of wind direction and wind speed will be performed during air monitoring. The meteorological data will be used each monitoring day to designate the upwind and downwind monitoring locations.

Noise Monitoring

The Borough of Pompton Lakes' noise ordinance protects the "peace and good order" of its residents. It does not have a quantitative sound level limit. However, sound level (5-minute A-weighted averages) will be measured at least two times per day during air monitoring periods at the work perimeter. Additional sound level measurements will be made when new noise sources begin, when noise sources create higher than normal noise, or when complaints are received from the community. The on-site technician conducting the monitoring will notify Sevenson when sound levels are elevated [typically above 65 decibels (dBA)] to institute noise controls or modify its operation.

Vibration Monitoring

Structural inspections and vibration monitoring will be performed for garage and house structures within 100 feet of the work location where the vibration originated. Before commencing any construction activity that could cause vibration (i.e., sheetpile installation), Sevenson will retain a professional structural engineer to perform pre- and post-construction structural (garages and houses) inspections. The pre-construction survey will be performed prior to barrier installation and the post-construction survey will be performed following barrier removal. The survey will include items such as photographic documentation as well as recording of notes and measurements of potential areas of concern (e.g., spalling concrete, cracks, active leaking, construction joints, foundation settling, bearing seats of beam/column connections, bolts/connections, areas of corrosion). In addition, vibration monitoring of each surveyed structure will be performed during applicable construction activities using a three-component seismograph (or equivalent).

Monitoring Reporting

Dust measurements and mercury sample results will be presented graphically on a web site for public access within 48 hours after each monitoring day. Vibration monitoring results will be provided to the individual property owner in which the monitoring was conducted.

2.8 Restoration

Remedial actions will result in the temporary disturbance within regulated natural resource areas including state open waters (Pompton Lake and Acid Brook), freshwater wetlands, associated transition areas, and riparian zones (Figures 2-4 and 2-5). The pending actions also consist of temporary disturbance in other uplands required for staging and access, including public open space and parkland. These regulated and unregulated adjacent lands will be restored as necessary to satisfy permit/regulatory requirements, meet restoration objectives, and address community inputs where possible. The restoration objectives are to integrate such efforts with remedial actions with the intent to re-establish ecological functions and societal benefits that exceed those presently provided, as practicable.

In-depth restoration design details will be incorporated within project permit submittals, while preliminary plans are discussed herein. In overview, restoration will be conducted as a combination of in-kind rehabilitation of temporarily disturbed habitats and enhancement of adjacent transition/buffer areas, as possible. Restoration will be integrated with remedial efforts and the final designs will consider remedial action impacts and constraints, the restoration opportunities and associated limitations afforded by the landscape setting of the project, along with the desires of project area stakeholders. The following sections describe additional concepts regarding restoration of each primary resource area. For baseline purposes, general descriptions of the current condition of each area are also provided.

2.8.1 Uplands

The term “uplands” has been used previously in this document to describe remedial activities that will address soils contamination. For clarity, “uplands” (as discussed within this restoration section) refers to restoration activities that will be conducted on lands disturbed by remedial actions or staging and access that occur at higher elevations and that do not support open water (Pompton Lake), stream (Acid Brook), or wetland resources. As used within this section, uplands includes areas that may be disturbed as part of remediation within public parkland, the potential use of this land (Rotary Park and Lakeside Park) for temporary staging, processing, and for access to Pompton Lake or Acid Brook Delta. Uplands also occur as part of wetland transition areas; the restoration of which is described under Section 2.8.3. No privately held uplands are anticipated to be disturbed, but restoration of such property is discussed herein for clarity in the event that such disturbances do occur.

2.8.1.1 Public

Existing Conditions – Remedial activities will require excavation of uplands soils from a total of approximately 0.1 acre, as shown on Figure 2-5. The majority of these areas are along the southern edge of Rotary Park. Several additional isolated uplands remedial areas are located east of the park on the slope adjacent to the lake, a single location west of Acid Brook, uplands areas on the banks of Acid Brook, and the slope south of Rotary Park (Figure 2-5). In addition to these remedial areas, the use of Rotary Park, Lakeside Park, and connecting uplands for temporary staging may potentially disturb approximately 0.3 acre of uplands that are not within resource areas otherwise described (i.e., wetland transition areas or riparian zones). With the exception of Rotary and Lakeside Park, all of the above remedial/disturbance areas are described in the following subsection.

Rotary Park is located on Lakeside Avenue to the northeast of Acid Brook. The main portion of this ‘pocket park’ is maintained as lawn with decorative plantings, benches, and tables. A macadam walkway connects to areas east and west of the park including Lakeside Park, which is located at the northeastern extent of the project area (Figure 2-5 and Appendix E, Photographs 2.8-1 and 2.8-2).

To the east, Lakeside Park includes a macadam public boat ramp, a seasonally deployed floating dock, a small playground area, a support building and gazebo, a public utility structure, and lawn/tree covered open space (Figure 2-5 and Appendix E, Photographs 2.8-3 and 2.8-4).

Preliminary Restoration – The uplands remedial actions and staging/processing activities will require the temporary disturbance of Rotary Park, portions of Lakeside Park, connecting upland areas along Lakeside Avenue, and the clearing of lawn, ornamental, and woodland vegetation. The Lakeside Park building, playground, and public utility structures are not anticipated to be disturbed. Wetland transition areas and/or riparian zones extend across portions of these temporary uplands disturbance areas. These areas will be restored in-kind with additional elements, including:

- Re-establishment of uplands vegetation including native and ornamental plantings within the existing park planting beds.

- Enhancement of uplands vegetation within the riparian zone through installation of additional native shrubs and grasses.

- Enhancement of public open space areas within the project area by establishing additional planting beds.

- Replacement of park amenities and pathways and enhancement of public space and access by establishment of new pedestrian crossings of Lakeside Ave.; establishment of new trails in Rotary Park and enhancement of an existing trail that extends from Rotary Park into the Acid Brook wetland area; and establishing greater access along Pompton Lake by reconfiguring the existing walking path and public space.

Preliminary plans that present these elements are included as Figures 2-6 to 2-10. Trees, shrubs, park lawn, and ornamental plantings will be re-established in keeping with the existing conditions and, to practicable extents, community desires. Insight from discussions with community leaders, public surveys, and input from the community during an open information session, along with input from NJDEP has been used to develop the preliminary restoration plans and is being used to help finalize restoration designs for permit applications. Final uplands restoration designs will also take into account wetland transition area and riparian zone requirements.

2.8.1.2 Private

Existing Conditions – Privately held uplands proximate to the remedial activities are single-family residential properties. As previously noted, no privately held uplands areas are expected to be disturbed during remedial activities.

Preliminary Restoration – No restoration should be required for privately held uplands. However, in the event of temporary disturbance associated with the remedial activities, the restoration efforts anticipated to be implemented include:

- Replacement of uplands vegetation
- Replacement and/or repair of disturbed property amenities

Temporary disturbances to privately held uplands, if any, will be addressed through replacement of vegetation and replacement or repair of amenities, such as sidewalks, fencing, etc. Additionally, this replacement or repair approach would apply to project related disturbances, if any, that may impact amenities extending beyond private uplands areas and into Pompton Lake (e.g., private docks).

2.8.2 Pompton Lake

Existing Conditions – The approach to remediation of ABD sediments from Pompton Lake is presented in Section 2.5. Restoration of Pompton Lake will include the entire open water remedial area (approximately 26 acres; Figure 2-4). Existing conditions within the project area currently can be described as shallow open water (<6.6 feet deep) and SAV habitats. Based on the Cowardin system, the area is broadly classified as lacustrine littoral open water and aquatic bed habitats (i.e., SAV areas) with unconsolidated bottom material (Cowardin et al., 1979). However, National Wetland Inventory mapping identifies the area as deeper water habitat (limnetic, >6.6 feet deep), which would only apply to the southwestern portion of the project area. The majority of the project area includes water depths of approximately 3 to 5 feet, with shallower depth approaching the shoreline.

The existing substrate is predominantly fine-grained; silt and clay fractions account for 50 to 95 percent of the substrate. A layer of peat occurs below this substrate in portions of the project area. The fine-grained substrate supports a benthic macroinvertebrate community that is characteristic of temperate lentic systems (harpacticoid copepods, oligochaete worms [Oligochaeta], and midge larvae [Chironomidae]). In addition to the benthic community, the aquatic resources are used by numerous game and non-game fish species including bluegill (*Lepomis macrochirus*), yellow perch (*Perca flavescens*), and largemouth bass (*Micropterus salmoides*), among others. Recreational fishing is common throughout the lake. The portion of the lake closest to Acid Brook is also used extensively by geese and particularly swans; several dozens of which are often observed in the quiescent project area (Appendix E, Photograph 2.8-5).

Based on SAV mapping conducted in 2007 (Ocean Surveys, Inc., July 2007) and subsequent survey in early fall 2010, the littoral portion of the project area is extensively vegetated with aquatic macrophytes during the growing season with a mixture of submergent and emergent non-native invasive and native species (Appendix E, Photographs 2.8-5 and 2.8-6). The abundance of SAV (particularly submerged invasive species) is considered a nuisance by lakefront property owners, recreational users of the lake, and town officials. In previous years, this vegetation has impeded recreational use of public areas in vicinity of Lakeside Park (Figures 2-4 and 2-5). Within recent years, nuisance vegetation has been chemically treated annually by specialty subcontractors contracted with the town who are permitted by the state. A particular focus area of such treatment has been the near-shore and public boat ramp areas in proximity to Lakeside Avenue at Acid Brook and Lakeside Park, respectively; portions of which overlap the ABD sediment removal area.

Finally, existing conditions include lake water quality that is degraded by nutrient loading. A Total Maximum Daily Load (TMDL) has been adopted to address phosphorus impairments within the Pompton Lake drainage area, which includes the project area (NJDEP, 2007). According to a recently completed TMDL support study, much of the total phosphorous loading to the Ramapo River and Pompton Lake originates from the upper watershed (Quantitative Environmental Analysis, LLC [QEA], 2005).

Preliminary Restoration – Conceptually, the above aquatic resources will be restored through a combination of efforts that include:

- Re-establishing a beneficial substrate habitat for aquatic organisms.
- Enhancing desirable vegetation establishment through plantings.
- Establishing substrate and water column habitat heterogeneity through inclusion of supplemental structural materials and features.

As described in Section 2.5.6, remedial dredging will be followed by placement of granular material across the footprint of the remedial areas. The ecological habitat layer (i.e., eco-layer) will serve as a restoration foundation and desirable substrate habitat for aquatic benthic organisms. It is anticipated that the eco-layer will include approximately 6 inches of material (i.e., sand; natural unwashed) that will be placed through the water column in two distinct lifts (i.e., base layer and final layer). The base layer will be approximately 2 inches and the final layer will be approximately 4 inches, for a combined total of approximately 6 inches of material. The material will be placed using a hydraulic spreader system. The allowable placement tolerance for the eco-layer is -0 inches to +3 inches; no areas will be filled to an elevation greater than the existing sediment bed elevation.

Placement methods will minimize resuspension of residual bottom sediments to prevent mixing with the eco-layer materials. The base layer will not be placed until an appropriate amount of time has passed to allow for settling of sediments suspended in the water column as a result of dredging; however, placement of the base layer can be performed at the same time as dredging. The two areas will be separated by a turbidity curtain. The final layer will not be placed until dredging activities have been completed and the initial eco-layer has been placed.

Assuming a minimum of 6 inches of material for the eco-layer plus an additional 3 inches of material to account for over placement and/or material loss, the estimated volume of granular material required is approximately 31,500 cy. A sufficient supply of material will be delivered from the selected borrow source to the ABD such that the continuous placement of materials can be achieved.

The sheetpile system (and exterior turbidity curtain) installed prior to removal activities will remain in place during eco-layer placement activities. Following completion of eco-layer placement activities, the sheetpile system will be removed completely, followed by removal of the associated exterior turbidity curtain.

Sevenson will verify eco-layer thickness through the use of collection "pans" that are placed on the bottom of ABD. These pans will be placed along the ABD bed within the path of the material placement barge. Once the placement barge has made a pass, these pans will be brought to the surface and the material thickness will be measured. These measurements will also be supplemented with the collection of cores (via manual techniques) to visually confirm the material thickness and account for consolidation (e.g., 1 core per acre). A combination of hydrographic and RTK survey techniques will be conducted across the ABD following the placement of all material to document final remedial and restoration foundation conditions.

Final details regarding composition of this eco-layer will be incorporated into subsequent remedial action permit applications. A sand substrate will optimize ecological restoration objectives and will facilitate a rapid recovery of benthic macroinvertebrate and SAV communities. Specific portions of this eco-layer (primarily along the northern shoreline) will be planted to further expedite the re-establishment of desirable SAV species.

The above substrate will be supplemented with additional materials to establish substrate heterogeneity and habitat complexity that is currently lacking. Such material will include coarse gravel, anchored brush piles, and anchored large woody debris, and potentially rip-rap. Coarse gravel will be used in near-shore areas as establishment of spawning bed habitat benefiting nest-building fish species such as bluegill and largemouth bass. Additional structures (known as aquatic habitat enhancement devices) will also be included into the restoration using brush piles, and large woody debris (LWD) to provide three-dimensional aquatic habitat heterogeneity. Moreover, by extending such structures beyond baseline water surface elevations, several of these piles or LWD clusters may be designed to serve as basking sites for amphibians/reptiles and/or perch/forage habitat for birds. Preliminary locations for these aquatic enhancement devices are presented on Figure 2-6. Additional specifics and locations of these restoration features will be detailed within subsequent permit plans. In combination, the above elements will serve to restore aquatic habitat and will ultimately increase ecological functions and societal benefits associated with the restoration area.

Monitoring will be performed during eco-layer placement activities to assess the impact of construction on the surrounding environment and community (e.g., water column monitoring). Corrective action levels have been established and these levels must be achieved during all eco-layer placement activities (see Section 2.7 for additional details on monitoring activities, standards, and assessment actions).

2.8.3 Wetlands and Wetland Transition Areas

Existing Conditions – Based on the findings of wetland delineation conducted in 2009 for investigation permitting (URS, September 2009), approximately 1.02 acres of freshwater wetlands occur within the ABD Area landward of the approximate ordinary water level and are expected to be disturbed by the project activities. These resources are clustered in the northern portion of the ABD Area (Figures 2-4 and 2-5). The wetlands extend along the lower elevations of the confined Acid Brook floodplain, are bisected by Acid Brook, and also occur as a fringe along the toe of slope by Lakeside Avenue at Acid Brook. These wetlands were delineated in June 2009 and, based on the Cowardin system, the areas are classified as a complex of lacustrine littoral emergent non-persistent/palustrine forested broad-leaved deciduous/scrub-shrub wetlands (Cowardin et al., 1979). These resources include approximately 0.66 acres of palustrine emergent (PEM); 0.31 acres of palustrine forested (PFO), and 0.05 acres of palustrine scrub/shrub (PSS) wetlands (Note, wetlands described in this section do not include SAV habitat that has been previously described). In accordance with NJDEP N.J.A.C. 7:7A (NJDEP, November 2009) these areas are considered to have intermediate resource value and, as such, have a designated 50-foot wetland transition area that extends through much of the uplands remediation and anticipated temporary disturbance areas (Figure 2-5) (Appendix E, Photographs 2.8-7 to 2.8-12).

The wetlands are dominated by native vegetation but are also intermixed with non-native invasive species (e.g., Norway Maple [*Acer platanoides*], purple loosestrife [*Lythrum salicaria*] and Japanese knotweed [*Polygonum cuspidatum*]) that occur primarily on the lake and stream edge of the Acid Brook floodplain and throughout the more open narrow fringe wetland that extends along Lakeside Avenue at Acid Brook (Appendix E, Photographs 2.8-6, 2.8-7 and 2.8-9 to 2.8-11).

Wetland transition areas include uplands portions of the Acid Brook forested floodplain and adjacent slopes extending into public open space or parkland, onto school athletic field margins, and into existing roadways. Wetland transition areas associated with the temporary disturbances encompass approximately 1.4 acres. Within this transition area, the uplands forest/woodland adjacent to Acid Brook is a mixture of native and non-native species with an understory predominance of the invasive Norway maple (Appendix E, Photographs 2.8-13 and 2.8-14). Other uplands transition areas are predominately maintained as turf fields, open parkland (lawn), or vegetated slopes (Appendix E, Photographs 2.8-1 to 2.8-4, 2.8-10, 2.8-11).

The wetlands resources function as limited wildlife habitat and provide minimal flood desynchronization benefits. The resources are degraded and/or have reduced functional capacity due to landscape setting within a highly developed environment, invasive species, impacts from high-intensity stormwater flow from Acid Brook, previous and current land management practices, and recreational use of the area.

Preliminary Restoration – The remedial action and access activities will require the temporary disturbance of nearly all delineated wetlands within the project area. Avoidance and minimization practices will be applied to the extent practicable. For wetland and transition area resources that cannot be avoided, the restoration will be conducted as replacement in-kind and will include the following elements:

- Re-establishment of wetlands in areas of temporary disturbance.
- Establishment of additional wetland resources, as practicable and beneficial within the project area.
- Enhancement of wetland resources adjacent to temporary disturbances.
- Re-establishment and enhancement of existing transition area habitats.

Disturbed emergent, scrub/shrub, and forested wetland resources will be re-established within the Acid Brook floodplain and along the Lakeshore Avenue shoreline (Figure 2-6 to 2-10). Final wetland restoration designs to be incorporated with forthcoming project permit applications will take into account existing soil characteristics, hydrology, surface elevations, micro-topography, and plant community composition/distribution/structure, among other conditions or factors that influence restoration success. The re-established resources will be designed to provide wetland ecological functional capacity equal to or greater than those that are disturbed. To that extent, remedial activities adjacent to Acid Brook may provide the opportunity to establish additional wetland resources as part of remedial footprint restoration. Such opportunities will be further evaluated and integrated into restoration designs, as feasible.

As part of restoration efforts, remaining fringe wetlands that occur in immediate proximity to disturbance/restoration areas will be enhanced with supplemental native plantings.

Wetland transition areas will also be restored to existing conditions following remedial activities. As noted previously, transition areas are primarily forested uplands, maintained turf/lawn grass, and vegetated slopes. Forested uplands adjacent to Acid Brook will be replanted with native species from multiple stratum (e.g., herbaceous, shrub, understory trees, canopy trees) to re-establish a diverse structural habitat and vegetative community. Maintained turf/lawn grass areas will be restored in keeping with standard seed mixes and or sod application practices that may currently be employed by Board of Education and Pompton Lakes maintenance departments. Supplemental plantings will also be included in the design. Vegetated slopes along Lakeside Avenue at Acid Brook will be stabilized with jute erosion control matting, as necessary, and seeded to re-establish native herbaceous cover. These slopes will also be planted with supplemental shrubs and trees.

2.8.4 Acid Brook Stream and Riparian Zones

Existing Conditions – Within the project area, Acid Brook extends approximately 246 feet from Lakeside Avenue at Acid Brook to the confluence with Pompton Lake (Figures 2-4 and 2-5). The upstream portion of this reach (approximately 150 feet) extends through the higher elevation/uplands sections of the forested floodplain (Appendix E, Photograph 2.8-13 and 2.8-14). The lower reach meanders through the wetlands described in Section 2.8.3 (Appendix E, Photograph 2.8-8).

Based on the National Wetland Inventory mapping and the Cowardin system, Acid Brook is classified as riverine, lower perennial habitat with unconsolidated bottom that has previously been excavated (Cowardin et al., 1979). More specifically, the upper reach can be described as a single-thread entrenched and over-widened channel with highly eroded banks, extensive in-channel bar deposits, and negligible aquatic habitat. In the upper reach, stabilizing bank vegetation is largely limited to scattered trees. Urban debris (e.g., tires, trash) is common within the channel and along the banks. The channel bed is a mixed substrate of cobble, gravel, coarse woody material, and urban debris material. As previously noted, this reach has a modest base flow of approximately 0.7 cubic feet per second on average but receives storm and overland flows from stabilized upstream channel reaches and a watershed of predominately residential and developed areas. Based on the Rosgen classification system for stream channel types, this reach includes both F and G channels (Rosgen, 1996), which are considered unstable.

The downstream reach (approximately 100 feet) is a lower-gradient, wide channel that is generally actively meandering through the delta/floodplain wetlands. Several abandoned channels provide evidence of historic channel migrations. Stream banks are low, somewhat eroded, but primarily vegetated with shrub/scrub and herbaceous wetland species. Debris is present, and aquatic habitat is negligible. Based on the Rosgen classification system, the lower reach is a single-thread D channel (Rosgen, 1996).

Of note, based on historical aerial photography, the Acid Brook channel downstream of Lakeside Avenue was previously aligned such that flow was primarily routed along the western edge of the lower floodplain terrace (Figure 2-11). This is consistent with statements provided by long-time residents who have indicated the channel was relocated to the east about the time the aerial photograph was taken (1940) and would be in keeping with the structural alignment of the culvert under Lakeside Avenue. Given development practices of the time, the 1940 alignment likely also represents a channelized or excavated pathway.

As regulated waters, both Acid Brook and Pompton Lake have riparian zones, which provide a regulated ‘buffer,’ similar to wetland transition areas. Within the project area, riparian zones often overlap wetland transition areas; however, each carries different regulatory requirements. As per NJDEP Flood Hazard Area Control Act Rules (N.J.A.C. 7:13) (NJDEP, 2010), a 50-foot riparian zone extends landward from the bank of Acid Brook and from the

Pompton Lake ordinary water line (Figures 2-4 and 2-5). This area encompasses approximately 2.13 acres within the illustrated temporary disturbance area.

Preliminary Restoration – The remedial action and access activities will require the temporary disturbance of the Acid Brook stream bed and banks downstream of Lakeside Avenue at Acid Brook. Additionally, vegetation within portions of the associated riparian zone for both Acid Brook and Pompton Lake will need to be cleared. For Acid Brook and riparian zone resources that cannot be avoided, the restoration will be conducted as replacement in-kind and will include additional elements as follows:

- Re-establishment of Acid Brook as a lower perennial stream channel.
- Enhancement of aquatic habitats.
- Re-establishment and enhancement of riparian zone vegetation.

Acid Brook will be re-established and designed using criteria from applicable regulations (N.J.A.C. 7:13), principles of natural stream channel design adapted for an urban setting, and supported with engineering review. As previously described, the upper reach of Acid Brook south of Lakeside Avenue is considered degraded, eroded, and with sections of channel that are overly wide and unstable. These present conditions may be associated with previously noted historical actions unrelated to the current project that resulted in the realignment of Acid Brook from the western portion of the Acid Brook floodplain area to the eastern portion. Given these conditions that are representative of ‘flashy’ stormwater-driven systems, re-alignment of the channel and use of grade control structures will be considered to provide stability for the re-established stream bed and banks (Figure 2-6). Such actions and structures may also serve to enhance aquatic habitat for fish and other organisms. Conversely, re-establishment of the downstream reach of Acid Brook will likely not require such structures, and instead include design elements in keeping with an active delta environment. As with all project restoration designs, the re-establishment of Acid Brook will be integrated with adjacent wetland, transition area, riparian zone, and Pompton Lake restoration.

The riparian zone vegetation will be re-established in-kind. As feasible, supplementary woody vegetation plantings will be included in portions of the riparian zone that currently lack these species (e.g., on portions of vegetated slope along Lakeside Avenue at Acid Brook). Such supplemental planting may provide additional wildlife habitat, erosion control, and aesthetic benefits.

2.9 Contingency Measures

Contingency measures will be established to promote rapid and effective responses to any accidental releases within and outside of the enclosed area. Efforts will be made during the remediation activities to avoid any potential releases; as a precaution, the active work area will be enclosed by the isolation and containment systems discussed in Sections 2.4 and 2.5.

Sevenson has prepared a Contingency Plan to set forth procedures for responding to emergency conditions or events that may occur during the performance of the remedial action activities. The plan includes spill prevention, odor control methods, adverse weather contingencies, prevention of injury or damage by inclement weather and flood control contingencies, marine contingency measures, sediment processing/wastewater treatment spill responses, damage to overhead and underground utilities, emergency vehicle access and egress routes, offsite truck material spills, evacuation procedures, emergency numbers and route to the hospital, and a listing responsible persons. This document is provided in Appendix G.

Note also that DuPont will work closely with the affected community and involved agencies throughout the duration of remedial activities. Meetings will be conducted on a continuous basis with interested community members/groups to communicate factual project-related information and respond to community concerns in a timely fashion (as also described in Section 1.7). In addition, project information will be shared via fact sheets, web updates, mailers, and newspaper ads, as needed. The Pompton Lakes Works Information Center is also available for the community to visit to find updated information about the project.

2.10 Demobilization

Following completion of the work described in this document, including restoration activities described in Section 2.8, demobilization activities including the following will be performed:

- Dismantle the work area(s) and staging area(s).

- Clean/decontaminate equipment, if necessary, and construction-related materials prior to removal.

- Remove material, equipment, and support structures, and restore the impacted areas as appropriate.

The same access points described in Section 2.3, can potentially also be used for demobilization activities.

2.11 Completion Report

Following completion of the work, a Corrective Measures Completion Report will be prepared in general accordance with the current RCRA Corrective Action Plan guidance (EPA, May 1994). The report will describe the following: purpose of the remedial action; summary of soil/sediment remediated; detailed descriptions of the source and quantity of fill used; deviations from the Operations Plan and/or modifications if any necessitated by field conditions; documentation regarding achievement of RAOs and as-built drawings; summary of significant actions; and summary of inspection findings. A detailed description of restoration activities will also be included.

3. Permitting and Other Approvals

The proposed remedial and restoration activities will require authorizations and approvals from state and local authorities. The summary list provided below reflects the outcome of the NJDEP meetings and additional known or anticipated authorization requirements.

- NJDEP Wetlands Protection Act (N.J.A.C. 7:7A) – Freshwater Wetlands General Permit 4: Hazardous Site Investigation and Clean-up & Water Quality Certification – is required for remediation and dredging activities in and adjacent to freshwater wetlands, freshwater wetlands transition areas, and State open waters.

    - This permit meets Section 404 of the Federal Clean Water Act requirements to regulate discharge of dredged or fill material into the waters of the United States. Jurisdiction of which has been assumed by the State and is implemented through the NJDEP permitting process in accordance with Federal regulations.

- NJDEP Flood Hazard Area Control Act (N.J.A.C. 7:13): Requires individual Flood Hazard Area Permit with Hardship Waiver for remediation and dredging activities within the flood hazard area, which includes the floodway, flood fringe, and/or riparian zone (50 feet from normal water surface level or centerline of stream) of Pompton Lake and Acid Brook, respectively. For activities resulting in greater than 1,000 square feet of riparian zone disturbance, a hardship waiver for riparian zone disturbance would be required.

    - Approved Mitigation/Restoration Plan: This approval is required for the proposed disturbances authorized by a Freshwater Wetlands General Permit 4 and the Individual Flood Hazard Area Permit with Hardship Waiver. Flood hazard area disturbances may overlap (in the landscape) with wetland and wetland transition area disturbances and, therefore, can be restored while complying with both regulations.

    - Section 401 and NJDEP Water Quality Certification: Required to ensure consistency with Federal and State water quality standards and to control pollutant discharges including dredged or fill material into waters of the State. Issued by NJDEP concurrently with other permit instruments.

- New Jersey Department of Agriculture Soil Erosion and Sediment Control Act (Chapter 251, P.L. 1975): For earth disturbance projects exceeding 5,000 square feet, the Passaic County Soil Conservation District requires that an Erosion and Sediment Control Plan be prepared, certified, and implemented in accordance with regulations.

- NJDEP Stormwater Management Rules (N.J.A.C. 7:8) Stormwater Management Plan: The project will not be required to meet these rules due to the temporary nature of the project and the restoration of pre-activity topography and vegetated cover.

- NJDEP Division of Fish and Wildlife Scientific Collection Permit: Required for the collection, transport, and handling of aquatic species within the proposed dredging areas.

- Coordination with NJ State Historic Preservation Office regarding potential impacts to cultural resources under Section 106 of the National Historic Preservation Act within the project area.

- Coordination with NJ Natural Heritage Program and United States Fish and Wildlife Service regarding potential presence of threatened and/or endangered species within the project area.

- New Jersey Highlands Water Protection and Planning Act (Highlands Act): The project area is located within the Highlands Planning Area, and the Borough of Pompton Lakes has not filed a notice of intent to conform with the Highlands Act. Therefore, the Freshwater Wetlands regulations, as opposed to the Highlands regulations, are applicable to the project area.

- Soil Mining Ordinance of the Borough of Pompton Lakes: Required for any excavation and removal of soils over 500 cy.

Additional local permits will likely be required and will be obtained by Sevenson. Local permit approvals may include, but are not limited to, construction permits.

4. Project Schedule and Management

The estimated project schedule and anticipated management structure are presented below.

4.1 Schedule

The overall schedule for implementation of the remedial approach is presented below, and includes approximate timing for significant steps in the process and submittal dates for key deliverables to EPA. Note that this schedule has been developed in consideration of the Modification Compliance Schedule provided by EPA on May 4, 2010.

- Submittal of the Revised CMI WP: September 2011
- EPA Approval of Revised CMI WP: October 2011 (30 days after submittal)
- Permit Approvals, Implementation of Remedial Action, Restoration, and Submittal of Construction Completion Report: 4 years and 6 months after approval of the CMI WP

Note that some restoration could occur prior to completing all remedial activities, and therefore future tasks were grouped together for scheduling purposes. A detailed schedule for implementation of the remedial actions presented in this document is provided in Sevenson's Operations Plan; key dates from this schedule are provided below.

- Mobilization and site preparation: January to February 2012
- Uplands removal/backfill and associated activities: February to March 2012
- ABD containment system installation: March to April 2012
- ABD removal/eco-layer placement and associated activities: April to November 2012
- Demobilization: November to December 2012

- Restoration: December 2012 and May to June 2013

The schedule for implementation of the remedial activities will take into account work hour restrictions due to proximity of the uplands and ABD to the Lakeside Middle School, the ABD fish window and stocking program, and local and/or state laws. It is anticipated that the typical work hours for active removal/processing activities will be from 8:00 am to 6:00 pm, Monday through Saturday. It is expected that an additional hour will be required at the start and end of each work day for preparation/set-up and general shut-down activities. As such, it is anticipated that typical work hours during which personnel will be on-site will be from 7:00 am to 7:00 pm, Monday through Saturday.

Adjustments in work activities and timing will be required when school is in session (as discussed in Section 2.3) to minimize interference with school-related traffic. The fish window has been identified as May 1 through July 31, and therefore installation of the sheetpile containment system will be completed by the end of April. Additional coordination may be required if fish stocking were to occur in the vicinity of Pompton Lake. Sevenson will also adhere to any local and state laws or ordinances that may govern or restrict the performance of the work during regular or extra work hours.

4.2 Project Management

Multiple organizations will be involved in implementation of the remedial activities outlined within this document. The anticipated project team and responsibilities are:

- Agencies: EPA (lead) and NJDEP

- Implementing Organization/Responsible Party: DuPont

- Engineering Design/Support and Monitoring Efforts: ARCADIS, O'Brien and Gere, and Parsons

- Restoration and Permitting Support: URS

- Remediation Contractor: Sevenson

Organizations involved with the engineering design/support, restoration and permitting support, and construction will report directly to DuPont. DuPont will be the primary point of contact for EPA and NJDEP interactions.

5. References

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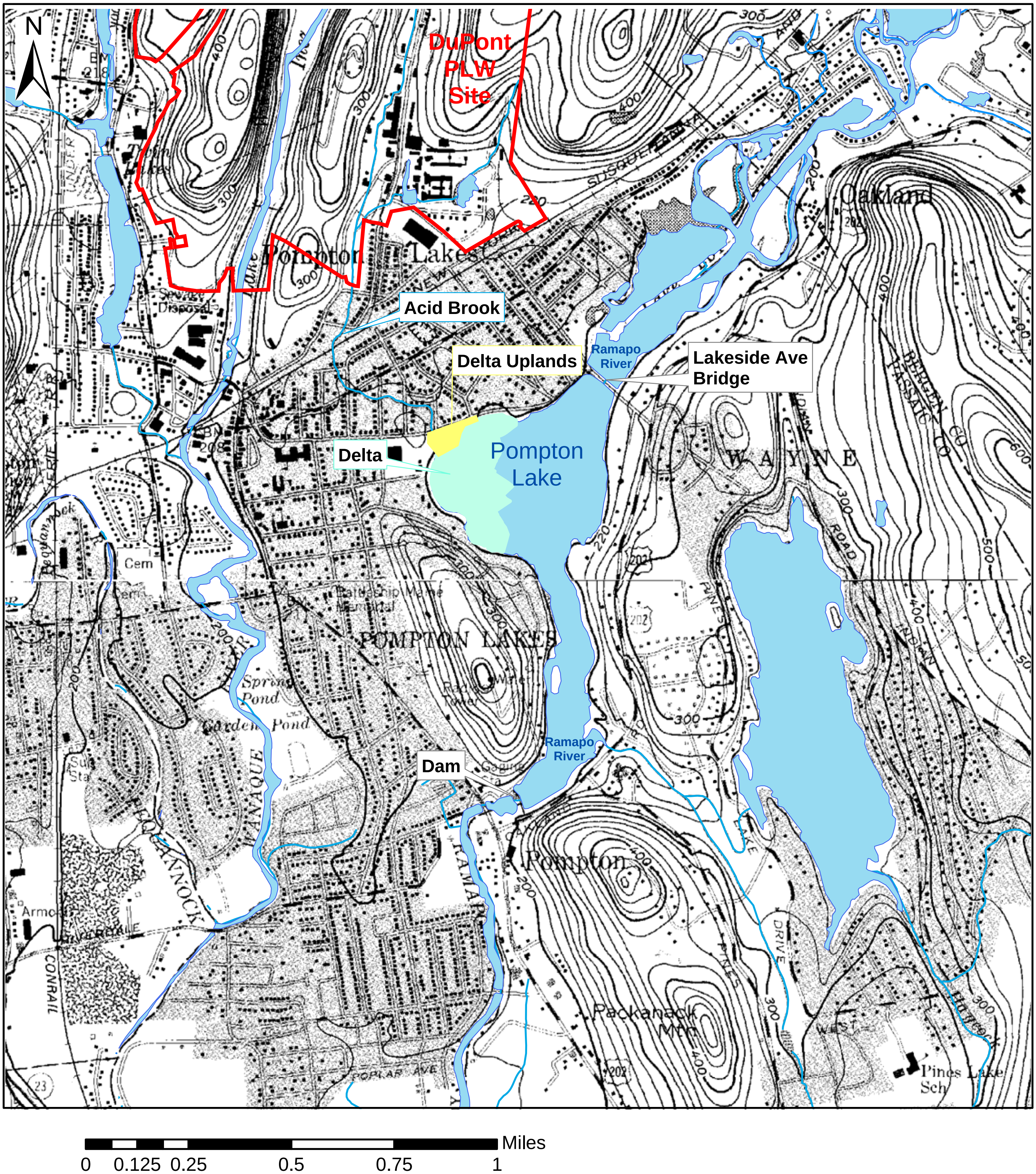
Figures



Legend:

Base is portions of the USGS Wanaque and Pompton Plains QUAD.

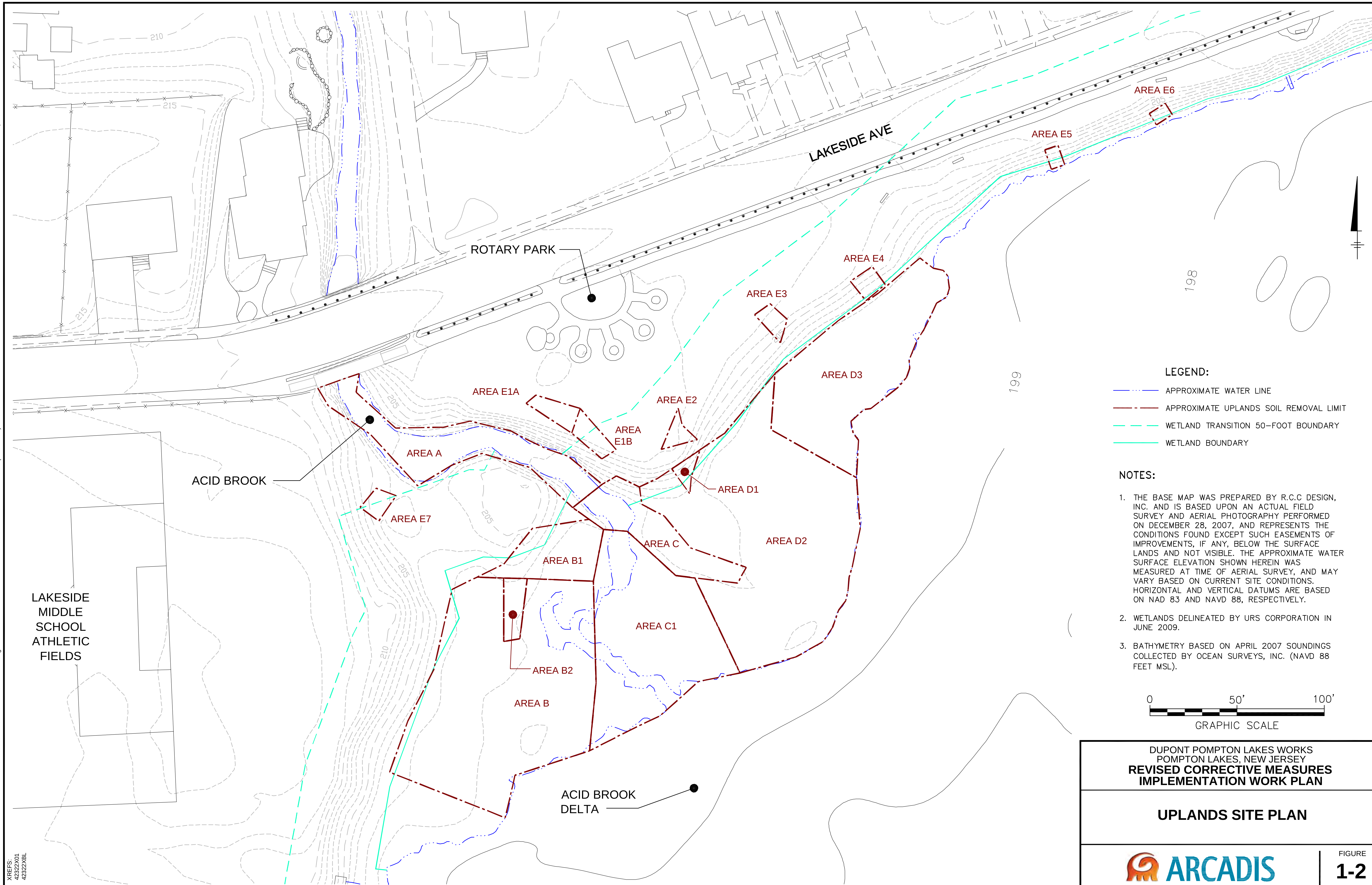
PARSONS

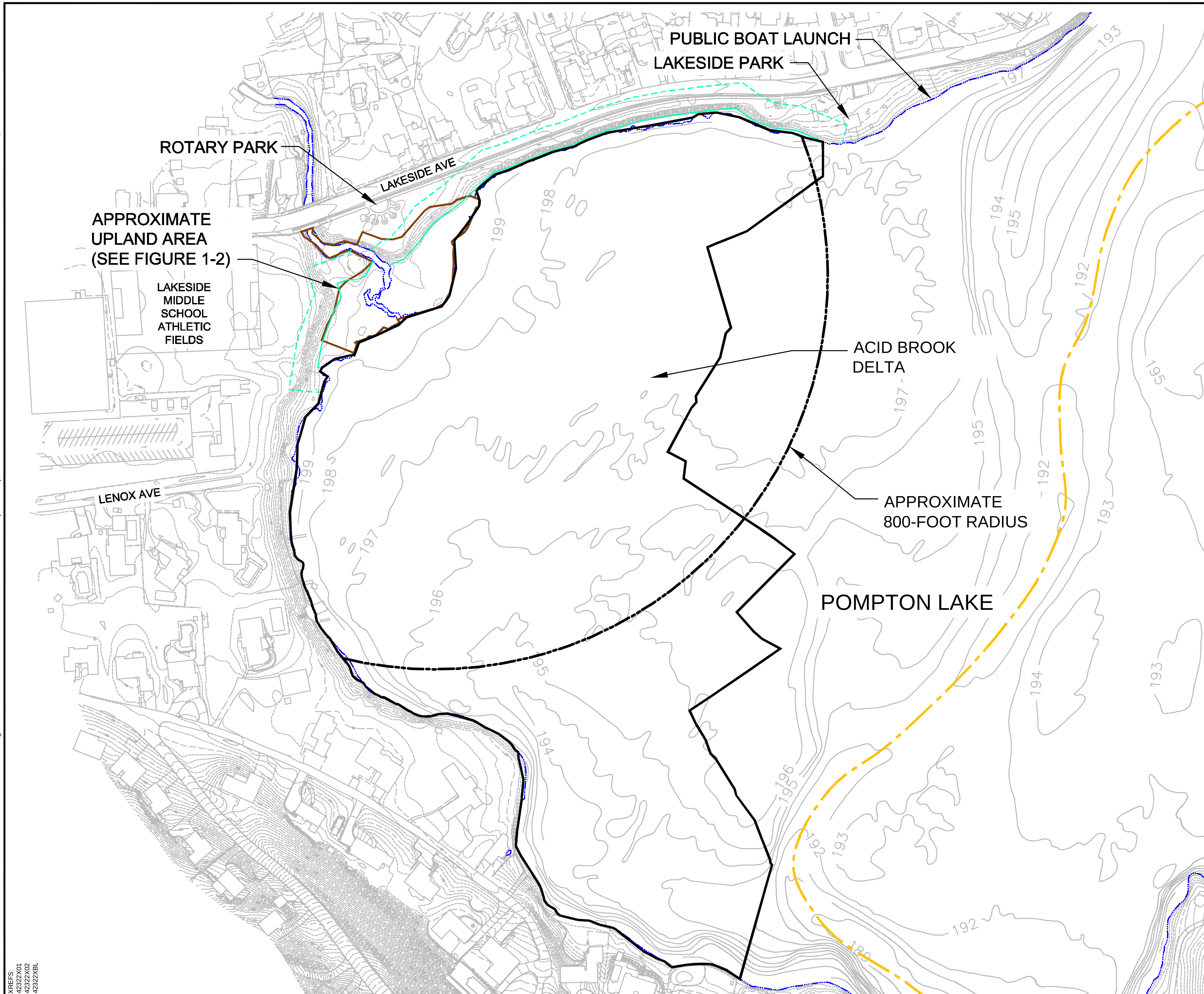
200 Cottontail Lane South
Somerset, New Jersey 08873

Site Location Map

DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Figure 1-1


LAKESIDE AVE
ROTARY PARK
ACID BROOK
LAKESIDE MIDDLE SCHOOL ATHLETIC FIELDS
ACID BROOK DELTA
AREA A
AREA B
AREA B1
AREA B2
AREA C
AREA C1
AREA D1
AREA D2
AREA D3
AREA E1A
AREA E1B
AREA E2
AREA E3
AREA E4
AREA E5
AREA E6
AREA E7
198
199
205
210
215
LEGEND:
APPROXIMATE WATER LINE
APPROXIMATE UPLANDS SOIL REMOVAL LIMIT
WETLAND TRANSITION 50-FOOT BOUNDARY
WETLAND BOUNDARY
NOTES:
1. THE BASE MAP WAS PREPARED BY R.C.C DESIGN, INC. AND IS BASED UPON AN ACTUAL FIELD SURVEY AND AERIAL PHOTOGRAPHY PERFORMED ON DECEMBER 28, 2007, AND REPRESENTS THE CONDITIONS FOUND EXCEPT SUCH EASEMENTS OF IMPROVEMENTS, IF ANY, BELOW THE SURFACE LANDS AND NOT VISIBLE. THE APPROXIMATE WATER SURFACE ELEVATION SHOWN HEREIN WAS MEASURED AT TIME OF AERIAL SURVEY, AND MAY VARY BASED ON CURRENT SITE CONDITIONS. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.
2. WETLANDS DELINEATED BY URS CORPORATION IN JUNE 2009.
3. BATHYMETRY BASED ON APRIL 2007 SOUNDINGS COLLECTED BY OCEAN SURVEYS, INC. (NAVD 88 FEET MSL).
0
50'
100'
GRAPHIC SCALE
DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
REVISED CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN
UPLANDS SITE PLAN
ARCADIS
FIGURE
1-2



LEGEND:

- APPROXIMATE WATER LINE
- APPROXIMATE SEDIMENT REMOVAL AREA LIMIT
- CENTERLINE OF MAIN CHANNEL
- WETLAND TRANSITION 50–FOOT BOUNDARY
- WETLAND BOUNDARY

NOTES:

1. THE BASE MAP WAS PREPARED BY R.C.C DESIGN, INC. AND IS BASED UPON AN ACTUAL FIELD SURVEY AND AERIAL PHOTOGRAPHY PERFORMED ON DECEMBER 28, 2007, AND REPRESENTS THE CONDITIONS FOUND EXCEPT SUCH EASEMENTS OF IMPROVEMENTS, IF ANY, BELOW THE SURFACE LANDS AND NOT VISIBLE. THE APPROXIMATE WATER SURFACE ELEVATION SHOWN HEREIN WAS MEASURED AT TIME OF AERIAL SURVEY, AND MAY VARY BASED ON CURRENT SITE CONDITIONS. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.
2. WETLANDS DELINEATED BY URS CORPORATION IN JUNE 2009.
3. BATHYMETRY BASED ON APRIL 2007 SOUNDINGS COLLECTED BY OCEAN SURVEYS, INC. (NAVD 88 FEET MSL).

0 200' 400'

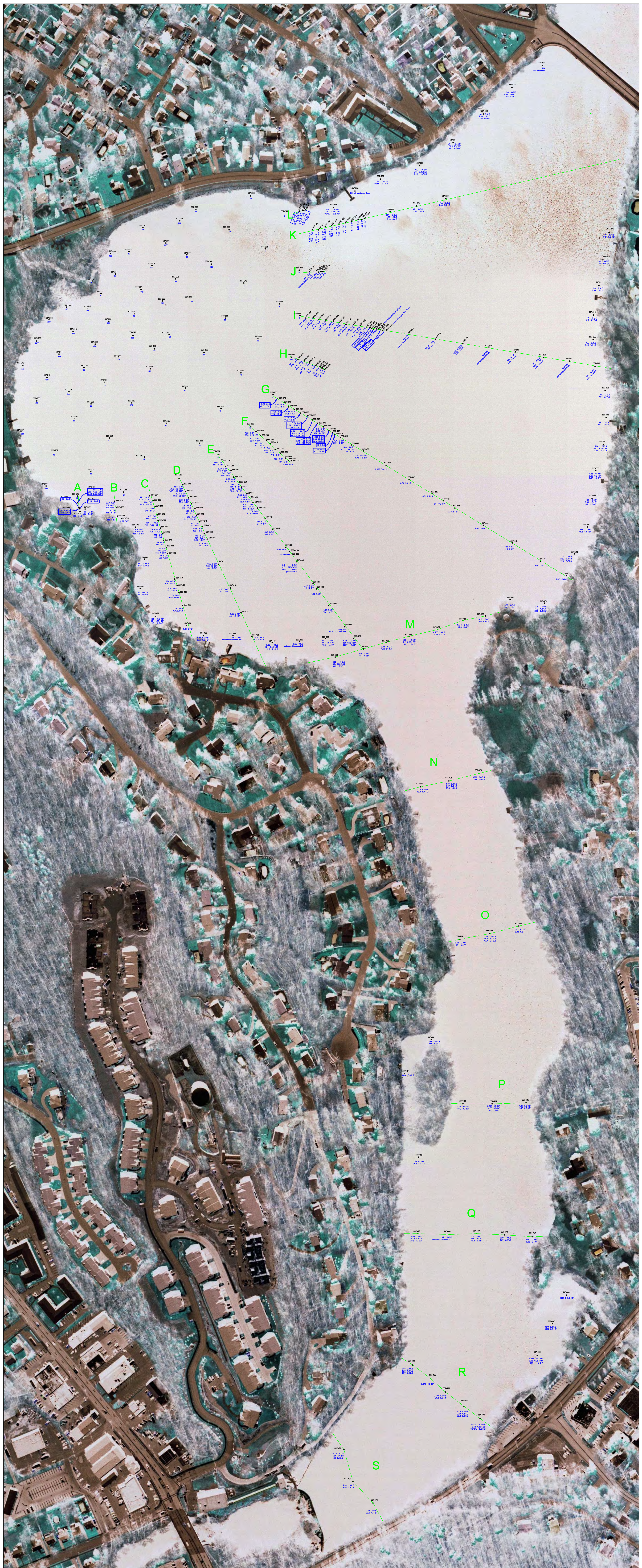
GRAPHIC SCALE

DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
REVISED CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

ACID BROOK DELTA SITE PLAN

ARCADIS

FIGURE
1-3



GRAPHIC SCALE

150 0 75 150

1 inch = 150 feet

LEGEND

537-432 ← Boring ID

○ ← Boring Location

1.92 0-0.5' ← Mercury Result (mg/kg) Depth (feet)
If no depth is shown, then depth is 0-0.5 feet

N.A. Not analyzed because interval not sampled.

Delineation Trajectory A— — —

Base maps are portions of the New Jersey 2002 High Resolution Orthophotography 5000 foot Tiles J4A9 and J4A13.

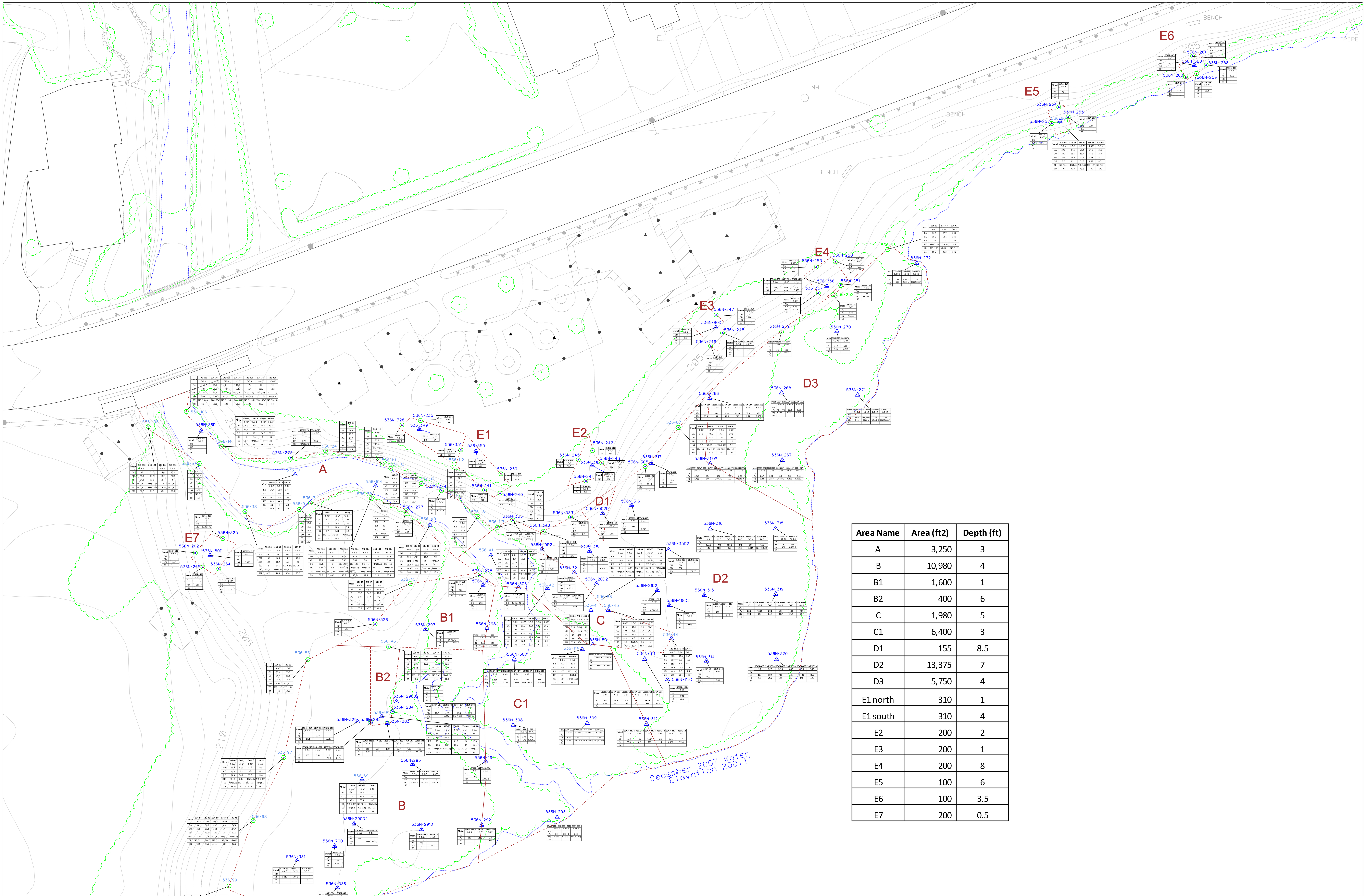
PARSONS
200 Cottontail Lane
Somerset, NJ 08873

Total Mercury Results mg/kg
December 2003 through November 2007

Acid Brook Delta
DuPont Pompton Lakes Works

Figure 1-4

...\Fig 1-4 ABD Hg Dec03 - No07.dgn 6/28/2010 3:20:19 PM



Area Name	Area (ft2)	Depth (ft)
A	3,250	3
B	10,980	4
B1	1,600	1
B2	400	6
C	1,980	5
C1	6,400	3
D1	155	8.5
D2	13,375	7
D3	5,750	4
E1 north	310	1
E1 south	310	4
E2	200	2
E3	200	1
E4	200	8
E5	100	6
E6	100	3.5
E7	200	0.5

LEGEND

LAKESIDE AVE REMEDIATION 1996
PERIMETER SAMPLE
BOTTOM SAMPLE
EXCAVATION LIMITS
OSHA BENCHING
536-71 BORING 1990 - 1993
536N-336 BORING 2009 - 2010

PROPOSED DELTA UPLANDS REMEDIATION
E7 PROPOSED REMOVAL AREAS
PROPOSED BOTTOM SAMPLE
PROPOSED PERIMETER SAMPLE
SURFACE WATER

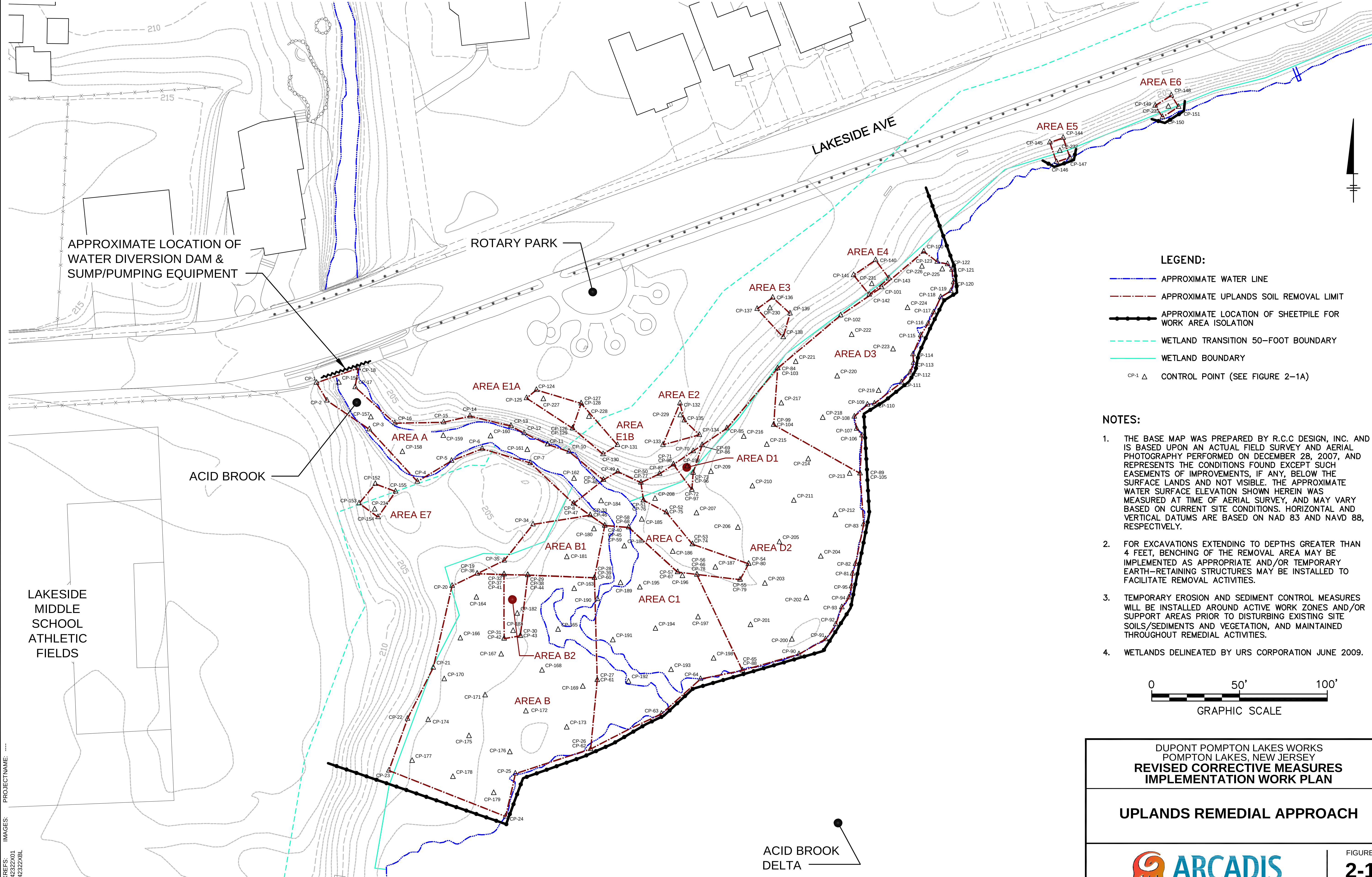
GRAPHIC SCALE
1 inch = 15 feet

PARSONS
200 Cottontail Lane
Somerset, NJ 08873

Uplands Delineation Areas
Revised November 2010

Acid Brook Delta
DuPont Pompton Lakes Works
Figure 1-5

...\Fig-1-5_Uplands Delineation Results_revised.dgn 12/21/2010 8:05:14 PM



NOTES:

1. THE BASE MAP WAS PREPARED BY R.C.C DESIGN, INC. AND IS BASED UPON AN ACTUAL FIELD SURVEY AND AERIAL PHOTOGRAPHY PERFORMED ON DECEMBER 28, 2007, AND REPRESENTS THE CONDITIONS FOUND EXCEPT SUCH EASEMENTS OF IMPROVEMENTS, IF ANY, BELOW THE SURFACE LANDS AND NOT VISIBLE. THE APPROXIMATE WATER SURFACE ELEVATION SHOWN HEREIN WAS MEASURED AT TIME OF AERIAL SURVEY, AND MAY VARY BASED ON CURRENT SITE CONDITIONS. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.
2. FOR EXCAVATIONS EXTENDING TO DEPTHS GREATER THAN 4 FEET, BENCHING OF THE REMOVAL AREA MAY BE IMPLEMENTED AS APPROPRIATE AND/OR TEMPORARY EARTH–RETAINING STRUCTURES MAY BE INSTALLED TO FACILITATE REMOVAL ACTIVITIES.
3. TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES WILL BE INSTALLED AROUND ACTIVE WORK ZONES AND/OR SUPPORT AREAS PRIOR TO DISTURBING EXISTING SITE SOILS/SEDIMENTS AND VEGETATION, AND MAINTAINED THROUGHOUT REMEDIAL ACTIVITIES.
4. WETLANDS DELINEATED BY URS CORPORATION JUNE 2009.

DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

REVISED CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

UPLANDS REMEDIAL APPROACH

ARCADIS

FIGURE **2-1**

Soil Removal Area	Control Point	Easting	Northing	Removal Depth (ft)
A	CP-1	552145.7	791188.4	3
A	CP-2	552151.7	791178.3	3
A	CP-3	552175.9	791161.9	3
A	CP-4	552203.2	791132.2	3
A	CP-5	552222.7	791144.0	3
A	CP-6	552240.1	791150.9	3
A	CP-7	552267.5	791142.8	3
A	CP-8	552292.2	791119.7	3
A	CP-9	552309.2	791133.2	3
A	CP-10	552289.6	791149.2	3
A	CP-11	552277.4	791153.4	3
A	CP-12	552264.1	791159.8	3
A	CP-13	552256.6	791163.8	3
A	CP-14	552233.2	791169.4	3
A	CP-15	552218.2	791165.9	3
A	CP-16	552190.4	791165.4	3
A	CP-17	552167.8	791186.0	3
A	CP-18	552169.5	791196.8	3
A	CP-156	552158.5	791188.5	3
A	CP-157	552176.7	791168.8	3
A	CP-158	552194.7	791149.0	3
A	CP-159	552218.0	791158.2	3
A	CP-160	552244.9	791157.9	3
A	CP-161	552265.8	791150.2	3
A	CP-162	552292.5	791133.8	3
B	CP-19	552237.3	791079.7	4
B	CP-20	552223.0	791072.8	4
B	CP-21	552212.3	791026.2	4
B	CP-22	552197.6	790997.1	4
B	CP-23	552187.0	790967.6	4
B	CP-24	552253.5	790941.5	4
B	CP-25	552259.1	790965.8	4
B	CP-26	552301.9	790979.9	4
B	CP-27	552305.7	791019.2	4
B	CP-28	552304.1	791077.4	4
B	CP-41	552252.6	791079.3	4
B	CP-42	552252.6	791042.7	4
B	CP-43	552261.8	791044.3	4
B	CP-44	552266.1	791079.0	4
B	CP-163	552292.5	791071.1	4
B	CP-164	552236.9	791066.1	4
B	CP-165	552283.4	791047.8	4
B	CP-166	552227.7	791042.9	4
B	CP-167	552251.0	791033.7	4
B	CP-168	552274.2	791024.5	4
B	CP-169	552297.5	791015.4	4
B	CP-170	552218.5	791019.6	4
B	CP-171	552241.8	791010.4	4
B	CP-172	552265.1	791001.3	4
B	CP-173	552288.3	790992.1	4
B	CP-174	552209.4	790996.3	4
B	CP-175	552232.6	790987.2	4
B	CP-176	552255.9	790978.0	4
B	CP-177	552200.2	790973.1	4
B	CP-178	552223.5	790963.9	4
B	CP-179	552246.7	790954.8	4
B1	CP-33	552301.7	791113.0	1
B1	CP-34	552269.1	791107.8	1
B1	CP-35	552252.7	791087.2	1
B1	CP-36	552237.3	791079.7	1
B1	CP-37	552252.6	791079.3	1
B1	CP-38	552266.1	791079.0	1
B1	CP-39	552304.1	791077.4	1
B1	CP-40	552310.0	791107.1	1
B1	CP-180	552303.9	791105.0	1
B1	CP-181	552288.4	791089.1	1
B2	CP-29	552266.1	791079.0	6
B2	CP-30	552261.8	791044.3	6
B2	CP-31	552252.6	791042.7	6
B2	CP-32	552252.6	791079.3	6
B2	CP-182	552260.1	791057.0	6
B2	CP-183	552257.8	791047.1	6

Soil Removal Area	Control Point	Easting	Northing	Removal Depth (ft)
C	CP-45	552310.0	791107.1	5
C	CP-46	552301.7	791113.0	5
C	CP-47	552292.2	791119.7	5
C	CP-48	552309.2	791133.2	5
C	CP-49	552317.4	791137.8	5
C	CP-50	552330.6	791131.6	5
C	CP-51	552332.0	791121.6	5
C	CP-52	552345.0	791114.7	5
C	CP-53	552359.9	791096.5	5
C	CP-54	552392.0	791085.3	5
C	CP-55	552387.1	791076.3	5
C	CP-56	552362.5	791079.2	5
C	CP-57	552351.5	791080.6	5
C	CP-58	552323.6	791106.1	5
C	CP-184	552307.9	791121.0	5
C	CP-185	552331.1	791110.5	5
C	CP-186	552348.7	791092.2	5
C	CP-187	552373.0	791083.2	5
C1	CP-59	552310.0	791107.1	3
C1	CP-60	552304.1	791077.4	3
C1	CP-61	552305.7	791019.2	3
C1	CP-62	552301.9	790979.9	3
C1	CP-63	552342.3	790999.9	3
C1	CP-64	552364.5	791019.7	3
C1	CP-65	552388.4	791024.6	3
C1	CP-66	552362.5	791079.2	3
C1	CP-67	552351.5	791080.6	3
C1	CP-68	552323.6	791106.1	3
C1	CP-188	552321.1	791095.3	3
C1	CP-189	552319.0	791074.3	3
C1	CP-190	552305.7	791065.3	3
C1	CP-191	552314.6	791041.8	3
C1	CP-192	552323.5	791018.3	3
C1	CP-193	552347.7	791024.8	3
C1	CP-194	552338.9	791048.3	3
C1	CP-195	552330.0	791071.8	3
C1	CP-196	552354.2	791078.4	3
C1	CP-197	552363.1	791054.9	3
C1	CP-198	552372.0	791031.4	3
D1	CP-69	552365.5	791153.0	8.5
D1	CP-70	552360.4	791149.5	8.5
D1	CP-71	552349.1	791141.9	8.5
D1	CP-72	552359.6	791127.6	8.5
D1	CP-73	552360.4	791137.2	8.5
D1	CP-199	552356.9	791140.9	8.5
D2	CP-74	552359.9	791096.5	7
D2	CP-75	552345.0	791114.7	7
D2	CP-76	552332.0	791121.6	7
D2	CP-77	552330.6	791131.6	7
D2	CP-78	552362.5	791079.2	7
D2	CP-79	552387.1	791076.3	7
D2	CP-80	552392.0	791085.3	7
D2	CP-81	552451.1	791079.8	7
D2	CP-82	552452.8	791085.3	7
D2	CP-83	552457.5	791107.8	7
D2	CP-84	552408.5	791196.7	7
D2	CP-85	552379.6	791162.5	7
D2	CP-86	552365.5	791153.0	7
D2	CP-87	552341.2	791136.6	7
D2	CP-88	552388.4	791024.6	7
D2	CP-89	552455.4	791136.9	7
D2	CP-90	552420.6	791033.9	7
D2	CP-91	552435.7	791042.5	7
D2	CP-92	552441.6	791050.9	7
D2	CP-93	552445.1	791060.6	7
D2	CP-94	552449.1	791066.3	7
D2	CP-95	552450.5	791072.5	7
D2	CP-96	552360.4	791137.2	7
D2	CP-97	552359.6	791127.6	7
D2	CP-98	552349.1	791141.9	7
D2	CP-99	552406.2	791164.5	7

Soil Removal Area	Control Point	Easting	Northing	Removal Depth (ft)
D2	CP-200	552416.6	791042.2	7
D2	CP-201	552393.0	791050.4	7
D2	CP-202	552424.8	791065.8	7
D2	CP-203	552401.2	791074.0	7
D2	CP-204	552433.1	791089.4	7
D2	CP-205	552409.5	791097.6	7
D2	CP-206	552385.9	791105.9	7
D2	CP-207	552362.2	791114.1	7
D2	CP-208	552338.6	791122.3	7
D2	CP-209	552370.5	791137.7	7
D2	CP-210	552394.1	791129.5	7
D2	CP-211	552417.7	791121.2	7
D2	CP-212	552441.3	791113.0	7
D2	CP-213	552449.5	791136.6	7
D2	CP-214	552425.9	791144.8	7
D2	CP-215	552402.3	791153.1	7
D2	CP-216	552389.2	791157.7	7
D3	CP-100	552491.7	791263.2	4
D3	CP-101	552467.7	791242.9	4
D3	CP-102	552444.4	791226.8	4
D3	CP-103	552408.5	791196.7	4
D3	CP-104	552406.2	791164.5	4
D3	CP-105	552455.4	791136.9	4
D3	CP-106	552456.5	791158.5	4
D3	CP-107	552453.5	791162.3	4
D3	CP-108	552452.2	791169.2	4
D3	CP-109	552459.7	791176.1	4
D3	CP-110	552463.6	791176.6	4
D3	CP-111	552479.1	791188.7	4
D3	CP-112	552484.0	791194.4	4
D3	CP-113	552485.9	791199.8	4
D3	CP-114	552485.6	791204.7	4
D3	CP-115	552490.0	791215.5	4
D3	CP-116	552494.2	791222.2	4
D3	CP-117	552497.4	791228.6	4
D3	CP-118	552501.4	791237.2	4
D3	CP-119	552507.2	791240.8	4
D3	CP-120	552508.7	791245.7	4
D3	CP-121	552507.8	791252.9	4
D3	CP-122	552505.3	791256.0	4
D3	CP-123	552499.4	791257.3	4
D3	CP-217	552410.6	791176.7	4
D3	CP-218	552434.2	791168.5	4
D3	CP-219	552466.0	791183.8	4
D3	CP-220	552442.4	791192.1	4
D3	CP-221	552418.8	791200.3	4
D3	CP-222	552450.6	791215.7	4
D3	CP-223	552474.2	791207.4	4
D3	CP-224	552482.5	791231.0	4
D3	CP-225	552502.2	791253.0	4
D3	CP-226	552490.7	791254.6	4
E1A	CP-124	552271.0	791184.4	1
E1A	CP-125	552265.4	791179.7	1
E1A	CP-126	552291.7	791162.5	1
E1A	CP-127	552296.5	791176.7	1
E1A	CP-227	552275.0	791179.1	1
E1B	CP-128	552296.5	791176.7	4
E1B	CP-129	552291.7	791162.5	4
E1B	CP-130	552309.0	791147.8	4
E1B	CP-131	552317.2	791153.0	4
E1B	CP-228	552301.0	791169.0	4
E2	CP-132	552352.8	791176.8	2
E2	CP-133	552343.1	791153.1	2
E2	CP-134	552363.9	791158.8	2
E2	CP-135	552355.3	791167.0	2
E2	CP-229	552353.0	791169.9	2
E3	CP-136	552405.7	791236.9	1
E3	CP-137	552396.8	791230.5	1
E3	CP-138	552411.6	791214.4	1
E3	CP-139	552415.5	791227.9	1
E3	CP-230	552404.1	791230.8	1

Soil Removal Area	Control Point	Easting	Northing	Removal Depth (ft)
E4	CP-140	552464.3	791258.3	8
E4	CP-141	552451.8	791249.8	8
E4	CP-142	552460.7	791238.6	8
E4	CP-143	552471.8	791248.0	8
E4	CP-231	552462.1	791244.7	8
E5	CP-144	552571.1	791327.9	6
E5	CP-145	552563.5	791325.3	6
E5	CP-146	552567.4	791314.2	6
E5	CP-147	552575.0	791316.8	6
E5	CP-232	552569.2	791320.5	6
E6	CP-148	552632.7	791352.1	3.5
E6	CP-149	552623.6	791346.3	3.5
E6	CP-150	552627.7	791339.8	3.5
E6	CP-151	552636.9	791345.6	3.5
E6	CP-233	552631.1	791345.7	3.5
E7	CP-152	552179.3	791130.9	0.5
E7	CP-153	552170.0	791119.8	0.5
E7	CP-154	552180.8	791111.9	0.5
E7	CP-155	552190.8	791126.5	0.5
E7	CP-234	552178.9	791116.3	0.5

NOTE:

1. EXISTING ELEVATIONS ARE APPROXIMATE, AND WILL NEED TO BE VERIFIED IN THE FIELD DURING THE PRE-CONSTRUCTION SURVEY. THE EXCAVATION ELEVATION WILL BE ADJUSTED AS NECESSARY BASED ON THE RESULTS OF THE PRE-CONSTRUCTION SURVEY. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.

DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
REVISED CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

UPLANDS REMEDIAL APPROACH CONTROL POINTS

ARCADIS

FIGURE
2-1A

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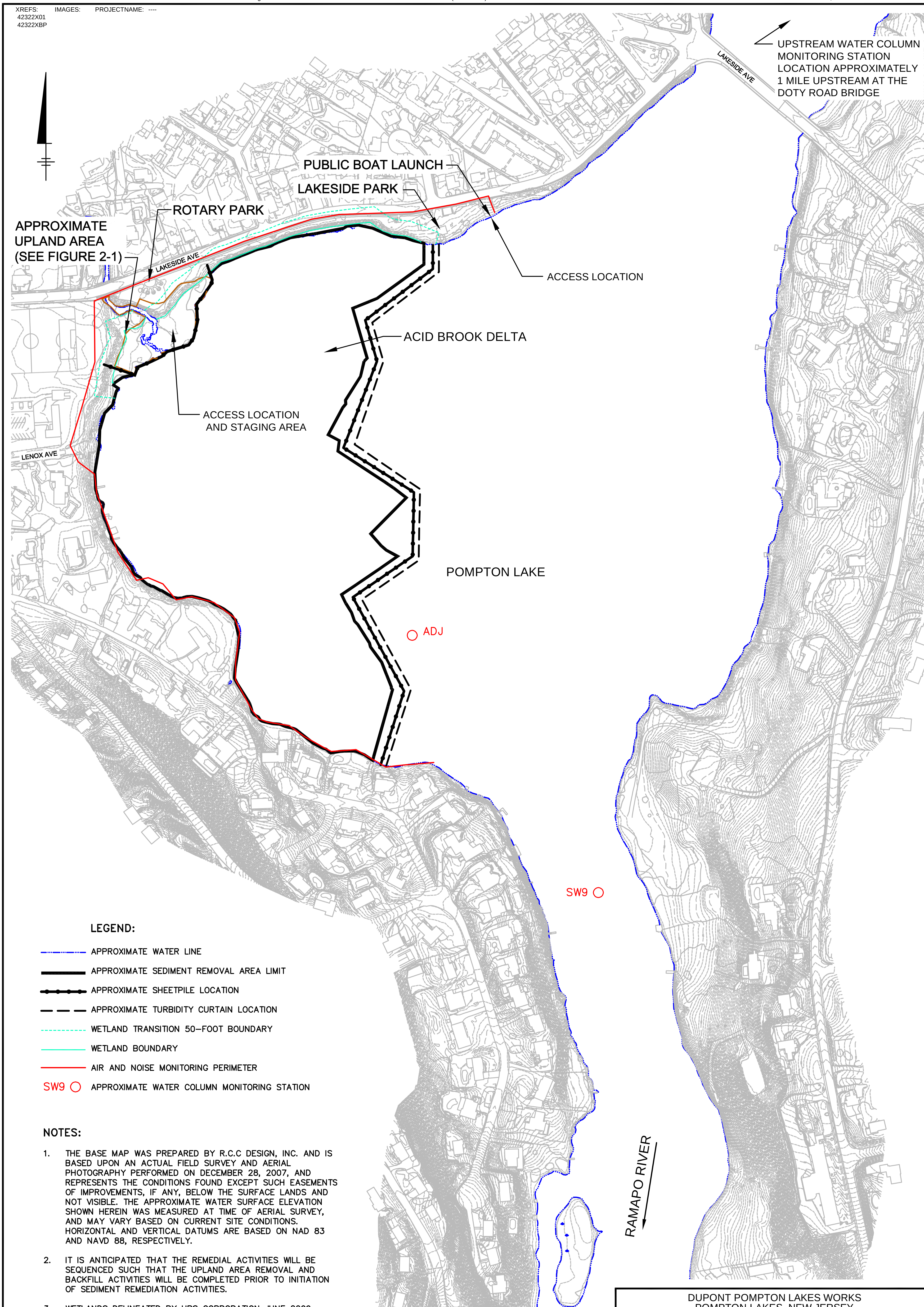


LEGEND:

- APPROXIMATE WATER LINE
- APPROXIMATE SEDIMENT REMOVAL AREA LIMIT
- APPROXIMATE SHEETPILE LOCATION
- APPROXIMATE TURBIDITY CURTAIN LOCATION
- WETLAND TRANSITION 50-FOOT BOUNDARY
- WETLAND BOUNDARY
- AIR AND NOISE MONITORING PERIMETER
- SW9 ○ APPROXIMATE WATER COLUMN MONITORING STATION

NOTES:

1. THE BASE MAP WAS PREPARED BY R.C.C DESIGN, INC. AND IS BASED UPON AN ACTUAL FIELD SURVEY AND AERIAL PHOTOGRAPHY PERFORMED ON DECEMBER 28, 2007, AND REPRESENTS THE CONDITIONS FOUND EXCEPT SUCH EASEMENTS OF IMPROVEMENTS, IF ANY, BELOW THE SURFACE LANDS AND NOT VISIBLE. THE APPROXIMATE WATER SURFACE ELEVATION SHOWN HEREIN WAS MEASURED AT TIME OF AERIAL SURVEY, AND MAY VARY BASED ON CURRENT SITE CONDITIONS. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.
2. IT IS ANTICIPATED THAT THE REMEDIAL ACTIVITIES WILL BE SEQUENCED SUCH THAT THE UPLAND AREA REMOVAL AND BACKFILL ACTIVITIES WILL BE COMPLETED PRIOR TO INITIATION OF SEDIMENT REMEDIATION ACTIVITIES.
3. WETLANDS DELINEATED BY URS CORPORATION JUNE 2009.
4. ADJ = ADJACENT TO ACTIVE REMEDIATION AREA.

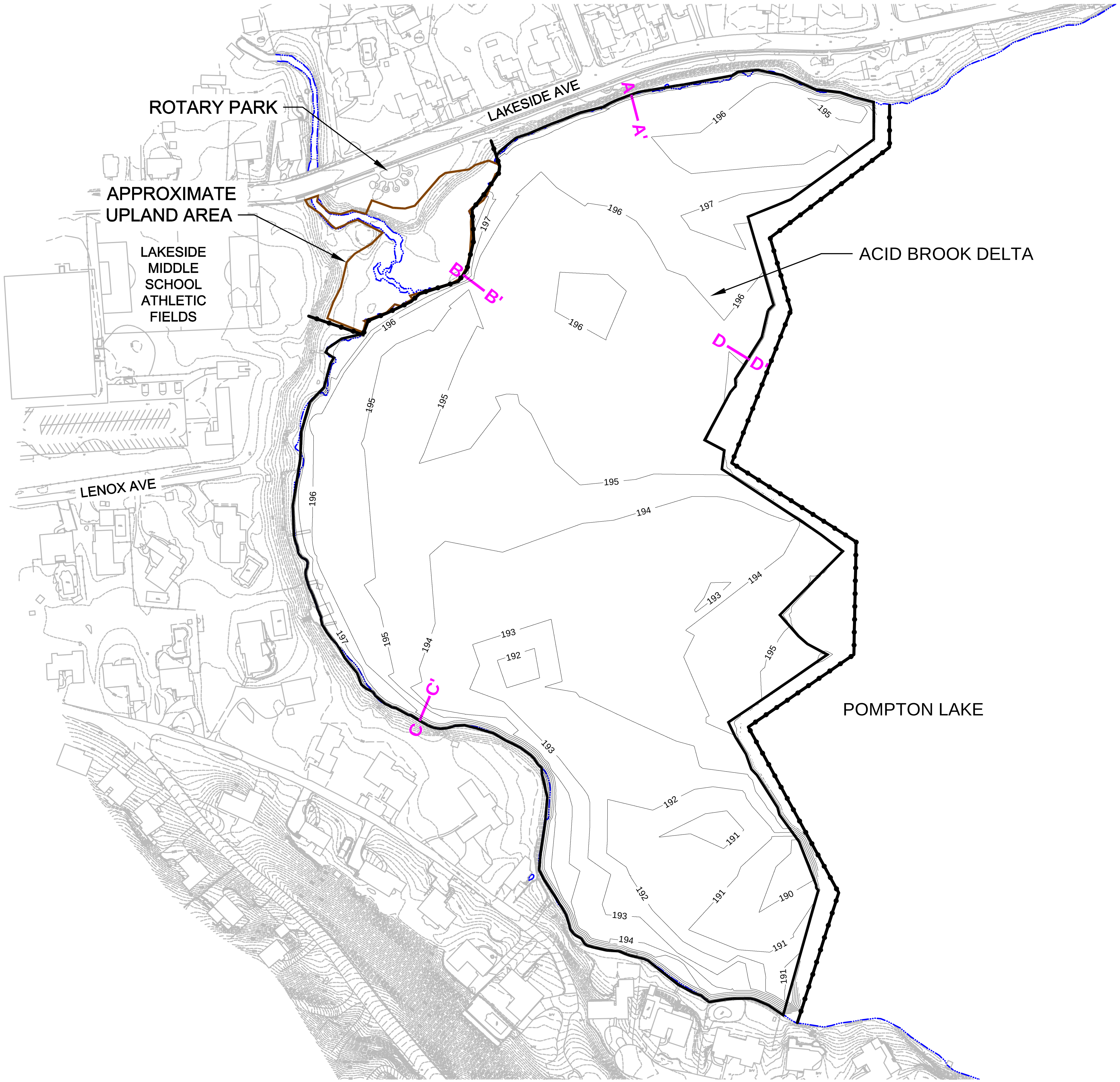
0 300' 600'
GRAPHIC SCALE

DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
REVISED CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

ACID BROOK DELTA REMEDIAL APPROACH

ARCADIS

FIGURE
2-2



LEGEND:

- CROSS SECTION TRANSECT
- APPROXIMATE SHEETPILE LOCATION
- APPROXIMATE SEDIMENT REMOVAL AREA LIMIT
- APPROXIMATE WATER LINE
- POST–DREDGE SURFACE CONTOURS (1–FOOT INCREMENTS)

NOTES:

1. THE BASE MAP WAS PREPARED BY R.C.C DESIGN, INC. AND IS BASED UPON AN ACTUAL FIELD SURVEY AND AERIAL PHOTOGRAPHY PERFORMED ON DECEMBER 28, 2007, AND REPRESENTS THE CONDITIONS FOUND EXCEPT SUCH EASEMENTS OF IMPROVEMENTS, IF ANY, BELOW THE SURFACE LANDS AND NOT VISIBLE. HORIZONTAL AND VERTICAL DATUMS ARE BASED ON NAD 83 AND NAVD 88, RESPECTIVELY.
2. POST–DREDGE SURFACE CONTOURS APPROXIMATED USING ESRI'S ARC GIS 3D ANALYST EXTENSION.

0 200' 400'
GRAPHIC SCALE

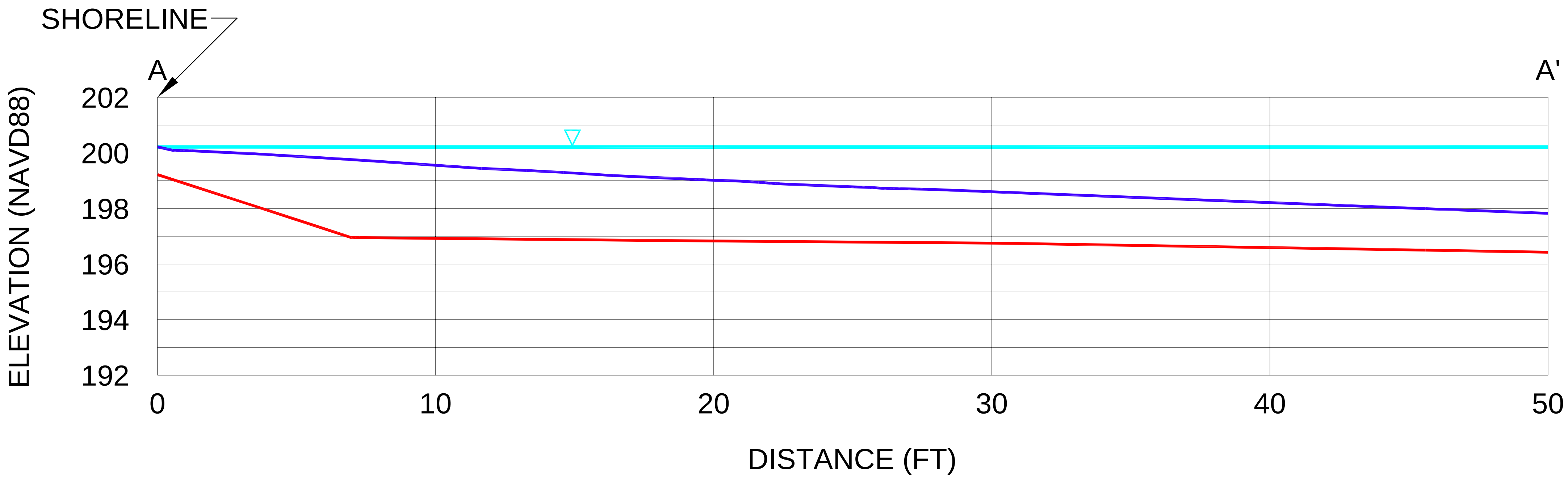
DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
REVISED CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

ACID BROOK DELTA DREDGE PRISM

ARCADIS

FIGURE
2-3

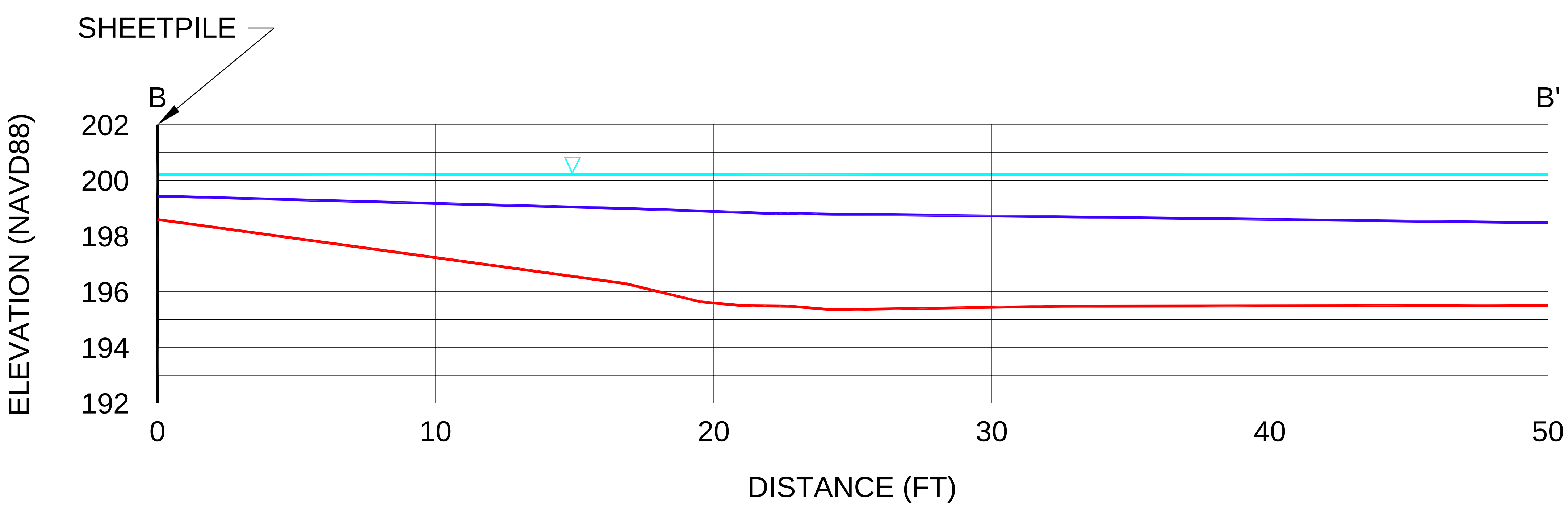
CROSS-SECTION A - A'
NORTHERN SHORELINE ADJACENT TO LAKESIDE AVENUE



LEGEND:

- EXISTING SEDIMENT SURFACE
- POST–DREDGE SURFACE
- APPROXIMATE WATER LINE

CROSS-SECTION B - B'
SHEETPILE BETWEEN UPLANDS AND ACID BROOK DELTA



0 5' 10'
HORIZONTAL GRAPHIC SCALE

0 5' 10'
VERTICAL GRAPHIC SCALE

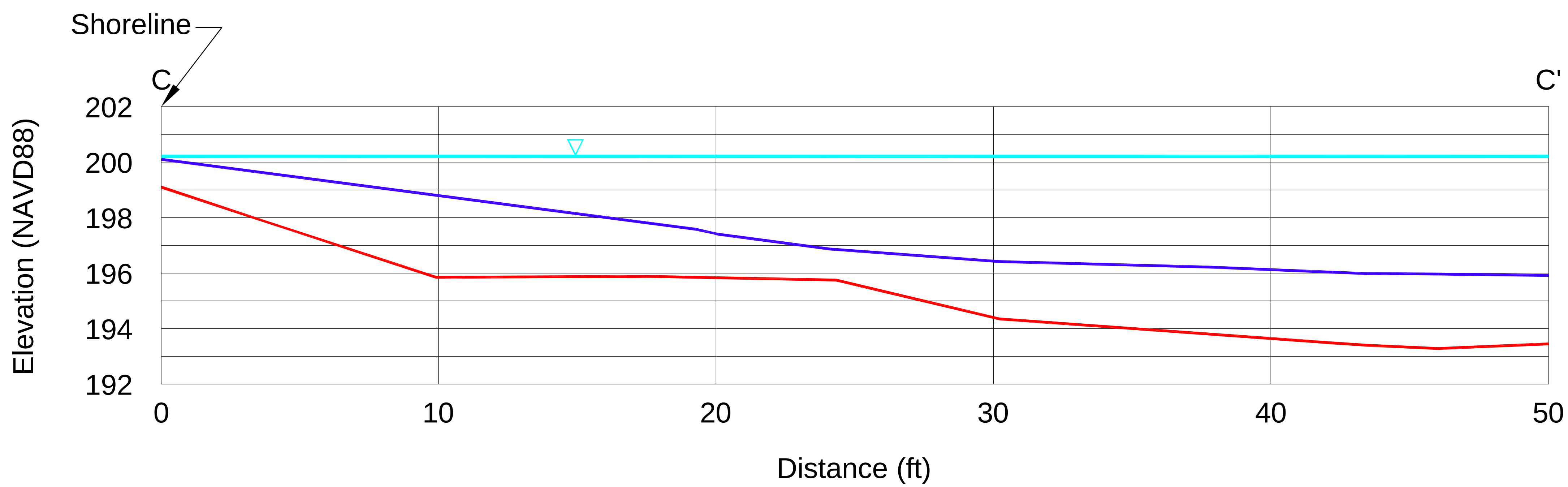
DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
REVISED CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

DREDGE PRISM CROSS SECTIONS

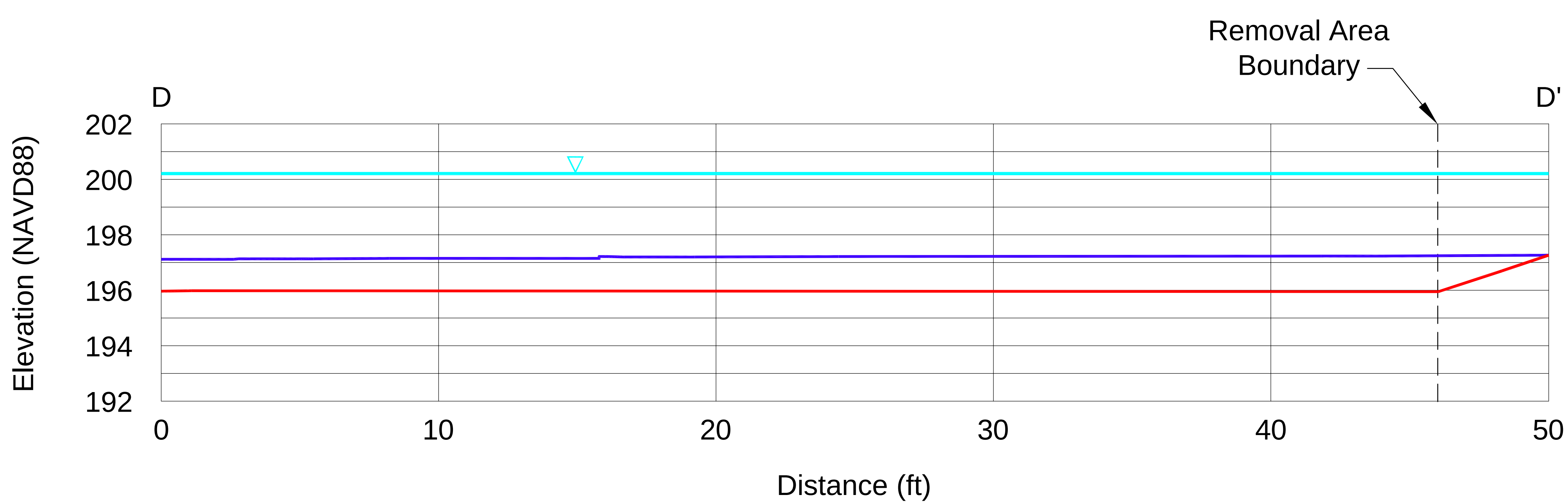
ARCADIS

FIGURE
2-3A

Cross-Section C - C'
Southwestern Acid Brook Delta Shoreline



Cross-Section D - D'
Eastern Acid Brook Delta Sediment



LEGEND:

- EXISTING SEDIMENT SURFACE
- POST–DREDGE SURFACE
- APPROXIMATE WATER LINE

0 5' 10'
HORIZONTAL GRAPHIC SCALE

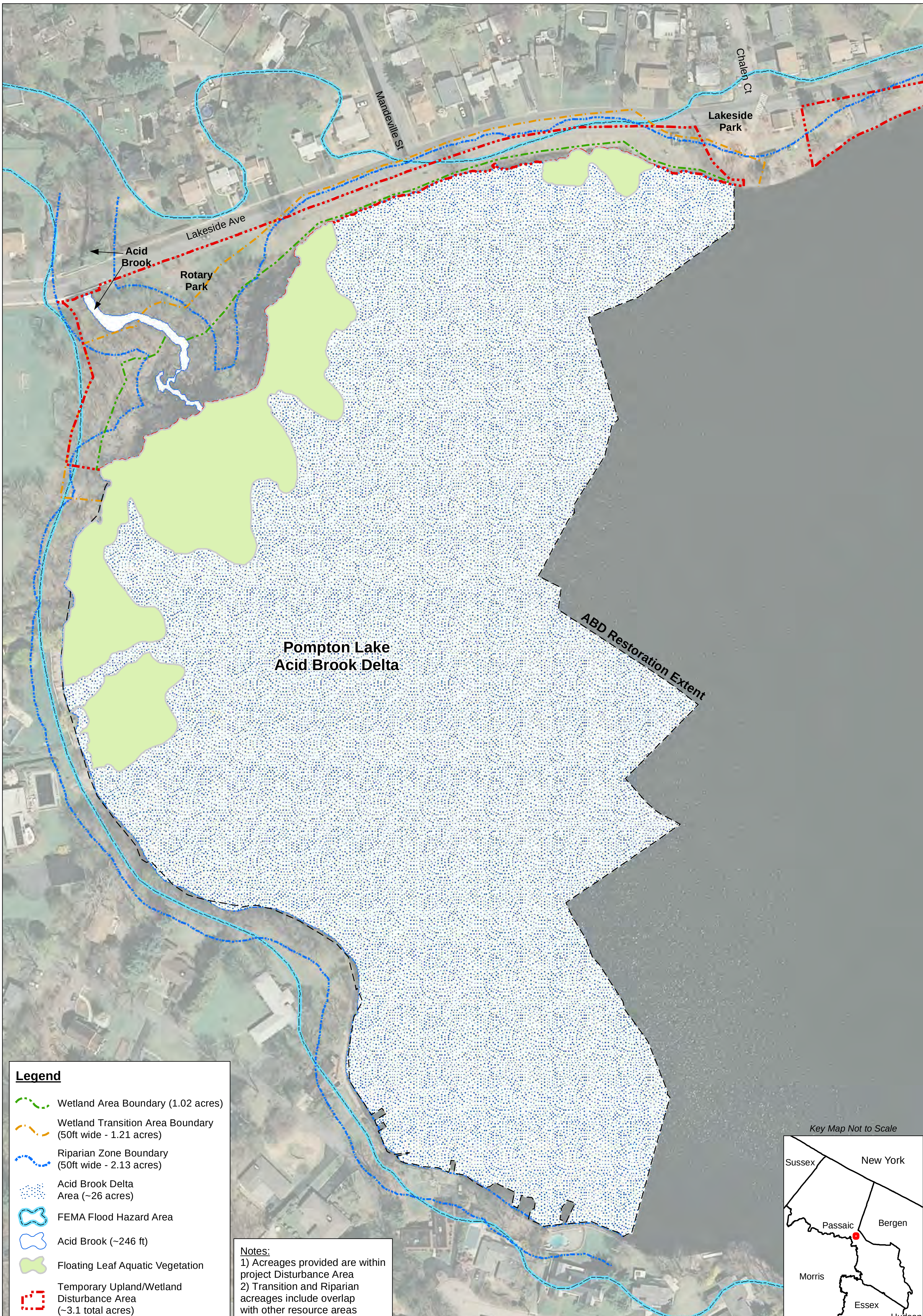
0 5' 10'
VERTICAL GRAPHIC SCALE

DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY
REVISED CORRECTIVE MEASURES IMPLEMENTATION WORK PLAN

DREDGE PRISM CROSS SECTIONS

ARCADIS

FIGURE
2-3B



URS

N

DUPONT POMPTON LAKES WORKS

PROJECT NO. 18985912

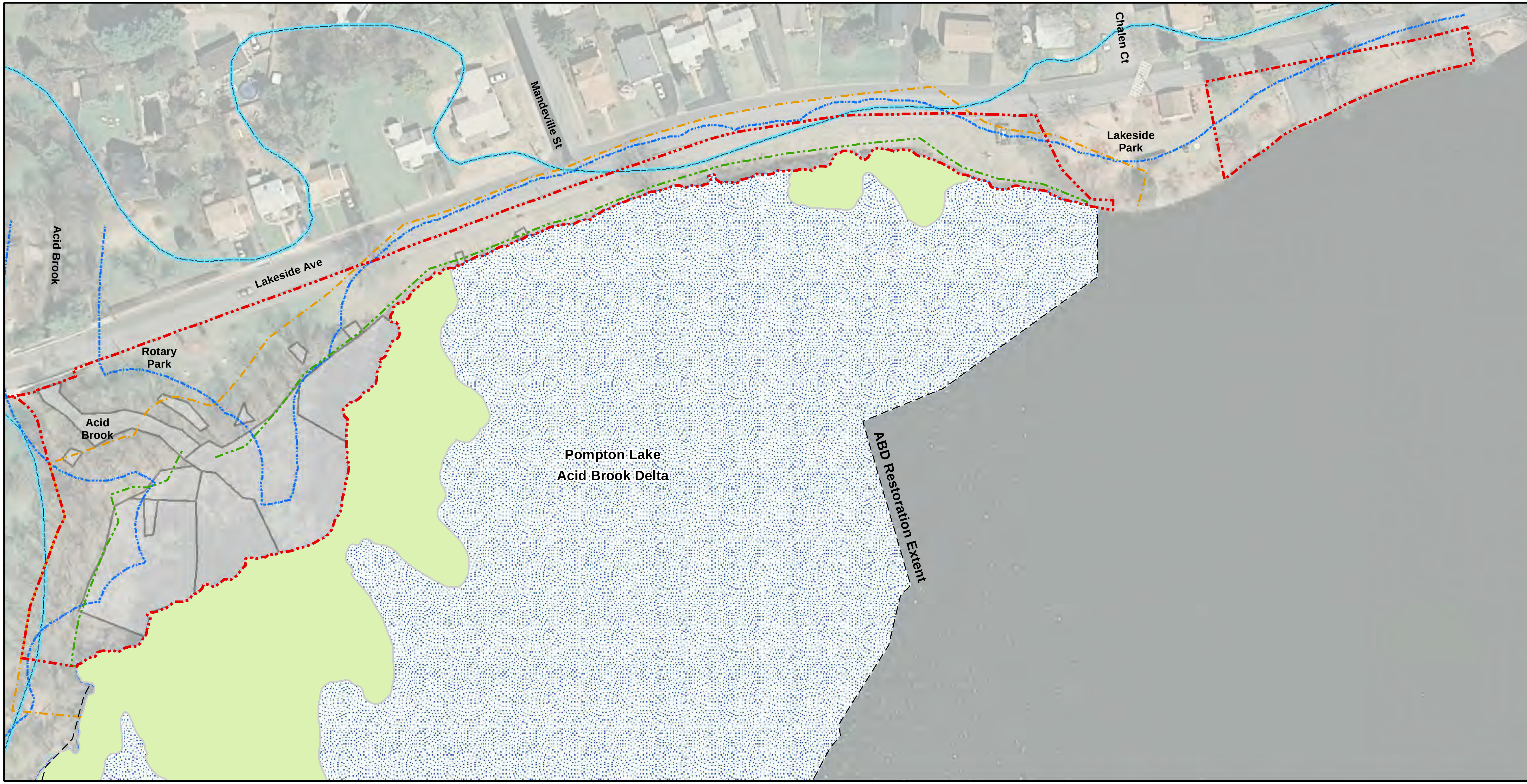
0 75 150 300 Feet

1 inch = 150 feet

Figure 2-4
Existing Conditions
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Source:
NJDEP 2007 Aerial Imagery
URS Custom Data

Q:\GIS_Data\DUPONT\PMPTNLKS\Projects\RAWP\Figure 2-4 Existing Conditions Acid Brook Delta.mxd



Legend

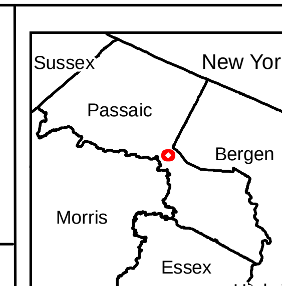
- Wetland Area Boundary (1.02 acres)
- Wetland Transition Area Boundary (50-ft wide - 1.21 acres)
- Riparian Zone Boundary (50-ft wide - 2.13 acres)
- Acid Brook Delta Area (~26 acres)
- FEMA Flood Hazard Area
- Upland Removal Area
- Floating Leaf Aquatic Vegetation
- Temporary Upland/ Wetland Disturbance Area (~3.1 total acres)

Notes:
1) Acreages provided are within project Disturbance Area
2) Transition and Riparian acreages include overlap with other resource areas

Figure 2-5
Existing Conditions - Detail
DuPont Pompton Lakes Works

Pompton Lakes, New Jersey

Prepared By: VP	Checked By: BB
Job: 18985912	Date: 08/29/2011



Key Map Not to Scale

Source:
NJDEP 2007 Aerial Imagery
URS Custom Data

NAD 1983 State Plane New Jersey
Projection: Transverse Mercator
False Easting: 492125.000000
False Northing: 0.000000
Central Meridian: -74.500000
Scale Factor: 0.999900
Latitude Of Origin: 38.833333
Linear Unit: Foot US

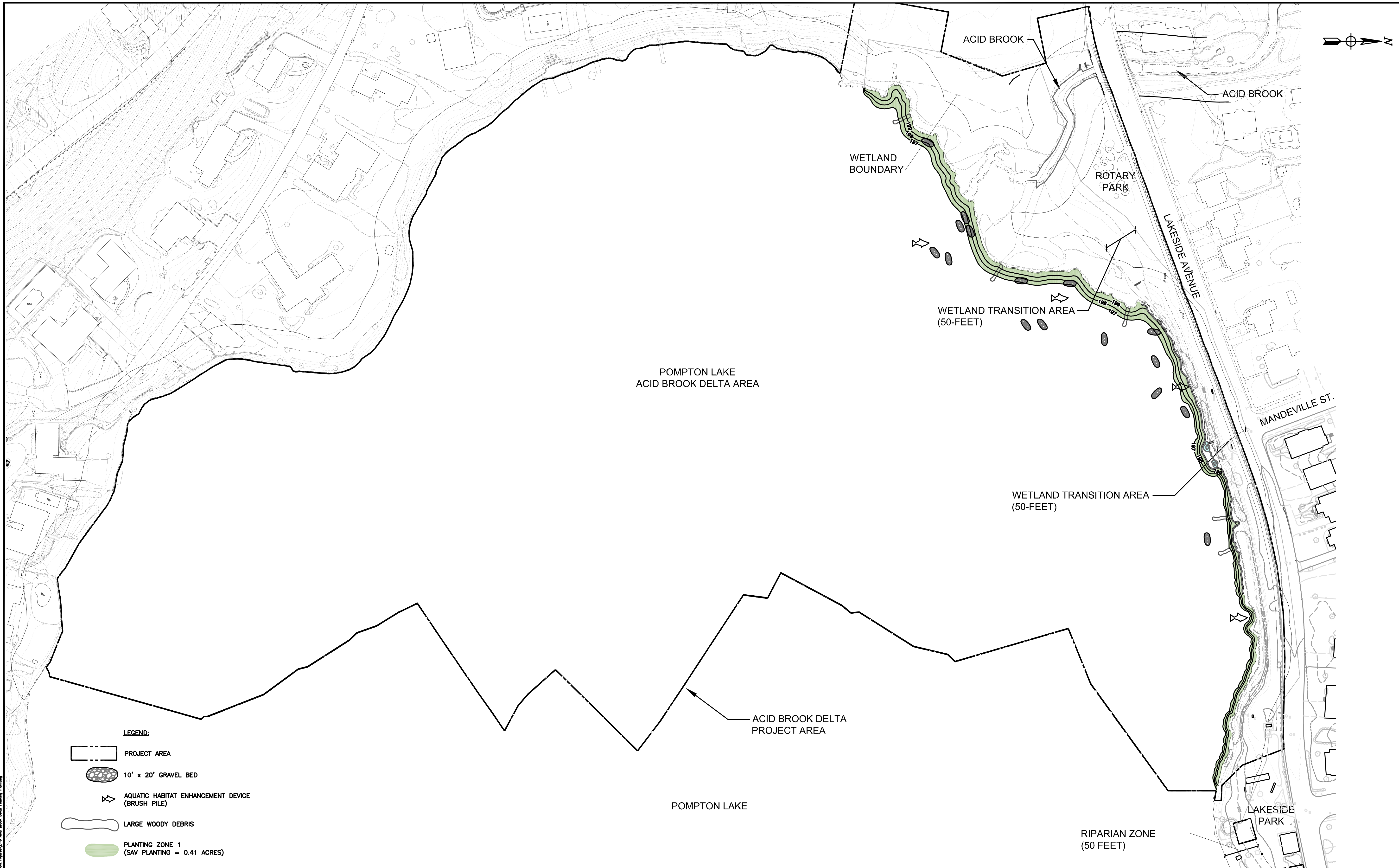
N

0 25 50 100 Feet

1 inch = 100 feet

URS

Q:\GIS_Data\DUPONT\PMPTNLKS\Projects\RAWP\Figure 2-5 Existing Conditions Detail Acid Brook Delta.mxd



REVISIONS				
NO.	BY	CHKD	DATE	DESCRIPTION
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△				
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△				

URS

(Signature) (Date)

PA. P.E. Certification No. (seal)

		DATE
DESIGNED BY:		
DRAWN BY:	JES	08/30/11
CHECKED BY:		
APPROVED BY:		
CLIENT APPROVED BY:		
FILE:		

0 30 60 120
SCALE: 1 INCH = 60 FEET

URS
335 COMMERCE DRIVE, SUITE 300
FORT WASHINGTON, PENNSYLVANIA 19034
(215) 367-2500 FAX (215) 367-1000

PRELIMINARY RESTORATION PLAN
ACID BROOK DELTA, DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

ACID BROOK DELTA PLANTING PLAN

JOB NO.	SCALE:
18985912	AS NOTED
SHEET	FILE No.
DRAWING NO. 2-6	REV

Drawing Location: K:\DUPONT\Pompton Lake\Report Figures\2-6 Acid Brook Delta Planting Plan.dwg
Drawn By: joseph_shell Sep 13, 2011 - 1:44pm

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PA. P.E. Certification No. (seal)

		DATE
DESIGNED BY:		
DRAWN BY:	JES	1/7/11
CHECKED BY:		
APPROVED BY:		
CLIENT APPROVED BY:		
FILE:		

0 10 20 40
SCALE: 1 INCH = 20 FEET

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PRELIMINARY RESTORATION PLAN
ACID BROOK DELTA, DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

ACID BROOK AREA
GRADING AND PLANTING PLAN

JOB NO. 18985912.00010
SCALE: AS NOTED
SHEET
FILE No.
DRAWING NO. 2-7
REV

Drawing Location: K:\DUPONT\Pompton Lake\Report Figures\2-6 thru 2-10 (Second Series)\2-7 Acid Brook Grading & Planting Plan.dwg
Drawn By: joseph_shell Sep 16, 2011 - 10:50am

LEGEND:

- PROJECT AREA
- 10' x 20' GRAVEL BED
- AQUATIC HABITAT ENHANCEMENT DEVICE (BRUSH PILE)
- LARGE WOODY DEBRIS
- PLANTING ZONE 1 (PRELIMINARY SAV PLANTING)
- PLANTING ZONE 2 (EM WETLAND)
- PLANTING ZONE 3 (SCRUB/SHRUB WETLAND)
- PLANTING ZONE 4 (PALUSTRINE FORESTED WETLAND)
- PLANTING ZONE 5 (S/S UPLANDS)
- PLANTING ZONE 6 (FORESTED UPLANDS)
- PLANTING ZONE 7 (PLANTING BED)
- PLANTING ZONE 8 (LAWN/TURF)

REVISIONS				
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(Signature) (Date)

PA. P.E. Certification No. (seal)

		DATE
DESIGNED BY:		
DRAWN BY:	JES	1/7/11
CHECKED BY:		
APPROVED BY:		
CLIENT APPROVED BY:		
FILE:		

0 10 20 40
SCALE: 1 INCH = 20 FEET

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PRELIMINARY RESTORATION PLAN
ACID BROOK DELTA, DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

LAKESIDE AVENUE AREA
GRADING AND PLANTING PLAN

JOB NO. 18985155.00010
SCALE: AS NOTED
SHEET
FILE No.
DRAWING NO. 2-8
REV

Drawing Location: K:\DUPONT\Pompton Lake\Report Figures\2-8 Lakeside Ave Grading & Planting Plan.dwg
Drawn By: joseph_shell Sep 13, 2011 - 1:43pm

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(Signature) (Date)

PA. P.E. Certification No. (seal)

		DATE
DESIGNED BY:		
DRAWN BY:	JES	1/7/11
CHECKED BY:		
APPROVED BY:		
CLIENT APPROVED BY:		
FILE:		

0 10 20 40
SCALE: 1 INCH = 20 FEET

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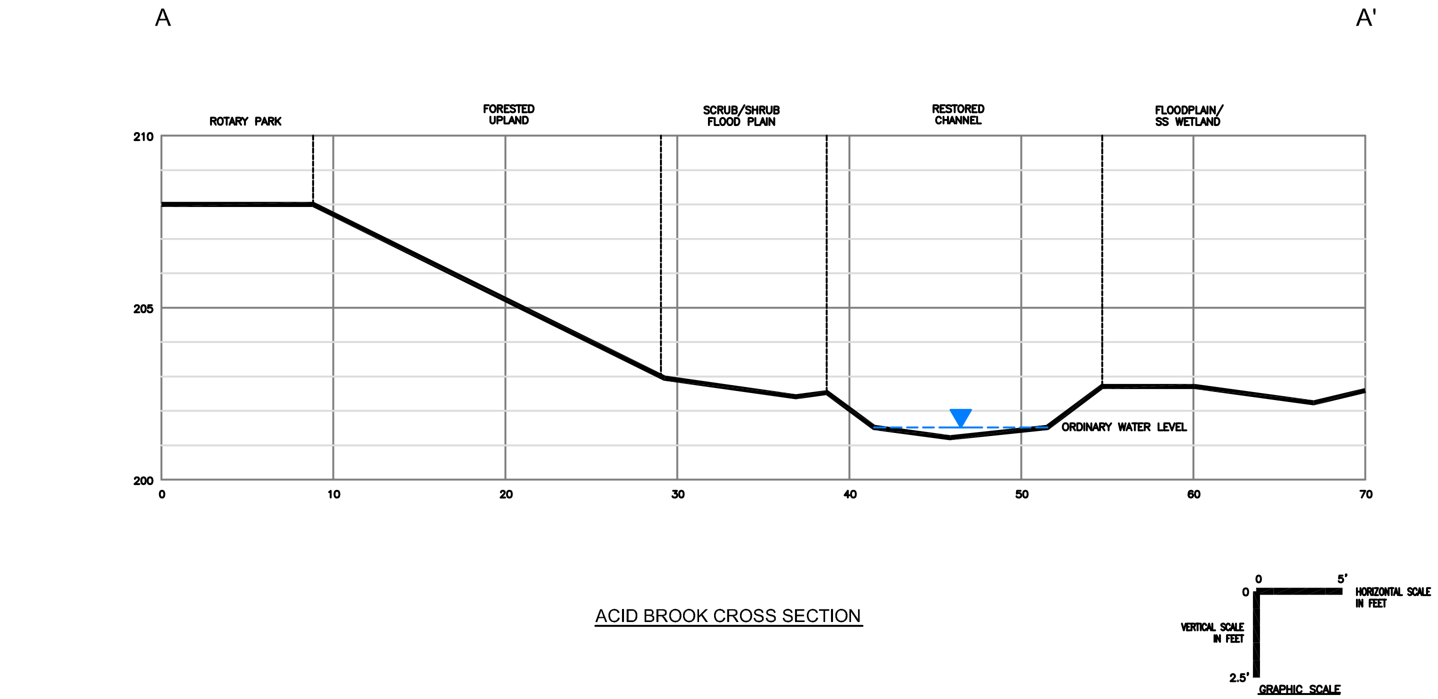
PRELIMINARY RESTORATION PLAN
ACID BROOK DELTA, DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

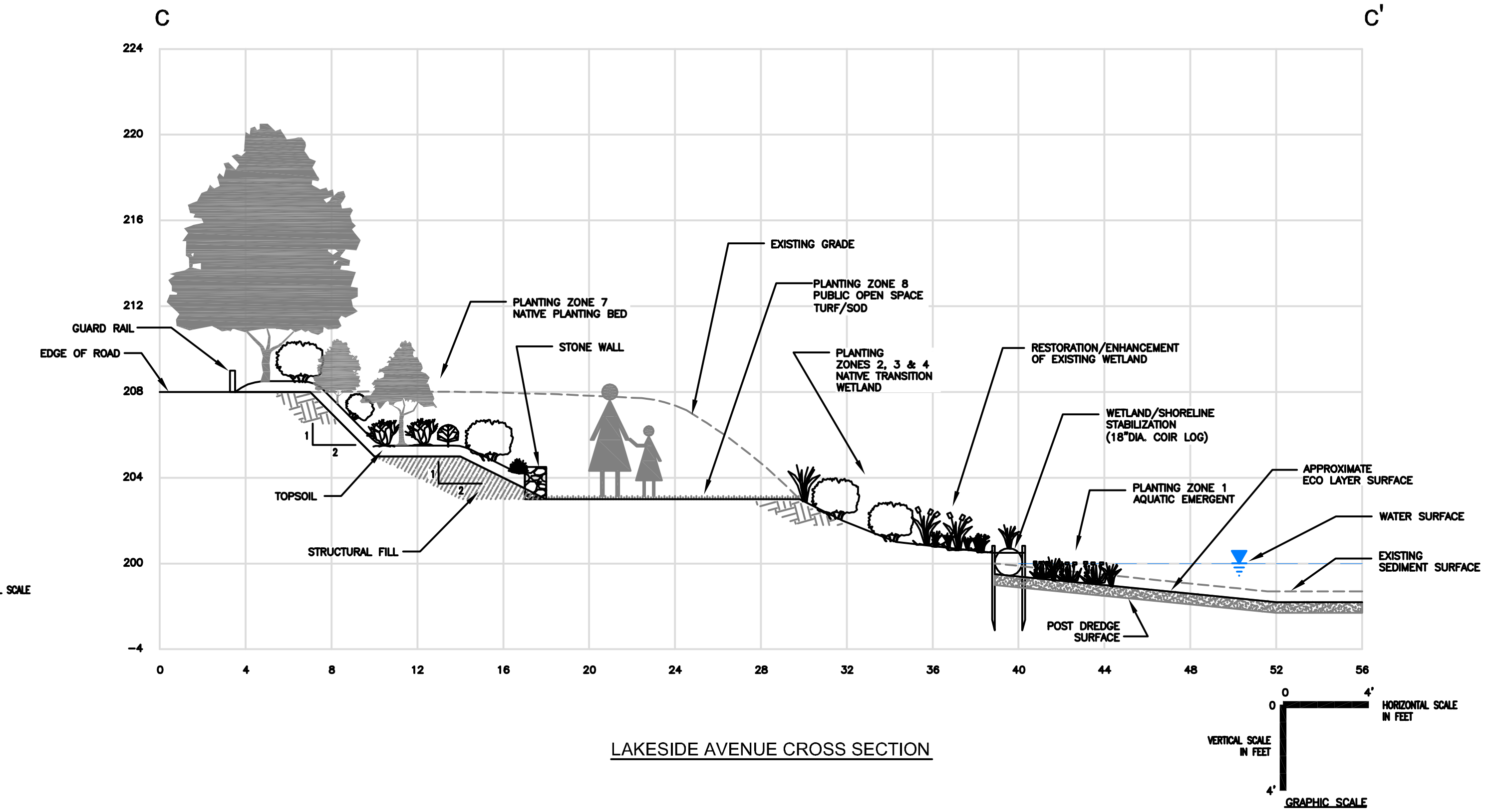
LAKESIDE PARK AREA
GRADING AND PLANTING PLAN

JOB NO. 18985155.00010 | SCALE: AS NOTED | SHEET | FILE No.
DRAWING NO. 2-9 | REV

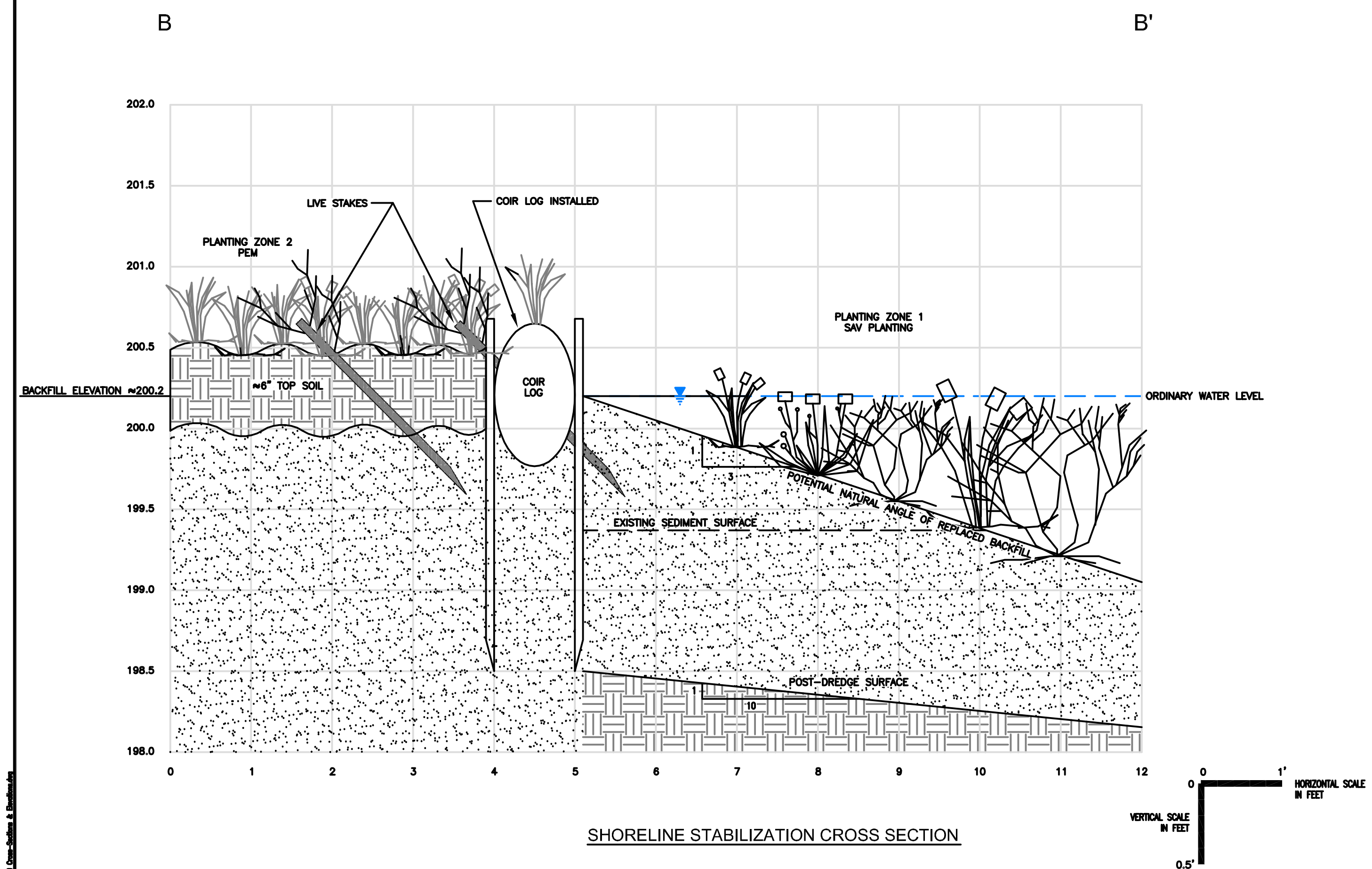
Drawing Location: K:\DUPONT\Pompton Lake\Report Figures\2-9 Lakeside Park Grading & Planting Plan.dwg
Drawn By: joseph_shell Sep 13, 2011 - 1:42pm



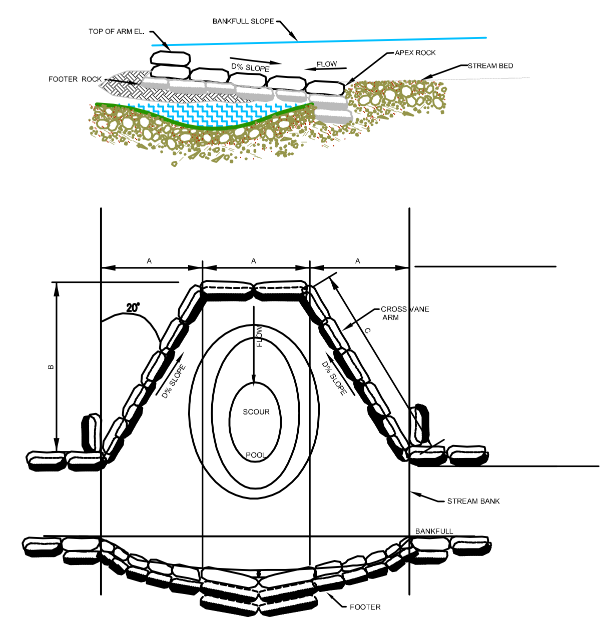
ACID BROOK CROSS SECTION



LAKESIDE AVENUE CROSS SECTION



SHORELINE STABILIZATION CROSS SECTION



CROSS VANE PLACEMENT
(N.T.S.)

NOTES:

1. THE TOP ROCKS SHALL BE LARGE FLAT ROCKS WITH A MEDIAN DIAMETER OF 2'.
2. FOOTER ROCKS NEED NOT BE FLAT, BUT SHALL BE OF EQUAL SIZE AND WEIGHT AS THE TOP ROCKS.
3. TOP ROCKS SHALL BE OFFSET UPSTREAM AND WEDGED AGAINST THE FOOTER ROCKS IN SUCH A MANNER THAT THE FLAT SIDE OF THE TOP ROCK IS FLUSH AGAINST A FLAT SURFACE ON THE FOOTER ROCK.
4. THE DIMENSIONS AND ANGLES SHOWN ON THE CROSS VANE DETAIL SHALL BE EXACT.
5. THE APEX ROCKS SHALL BE PLACED IN SUCH A MANNER AS THERE ARE NO GAPS BETWEEN THEM.

TYPICAL CROSS VANE STONE PLACEMENT
PLAN VIEW (NOT TO SCALE)

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CLIENT APPROVED BY:		
FILE:		

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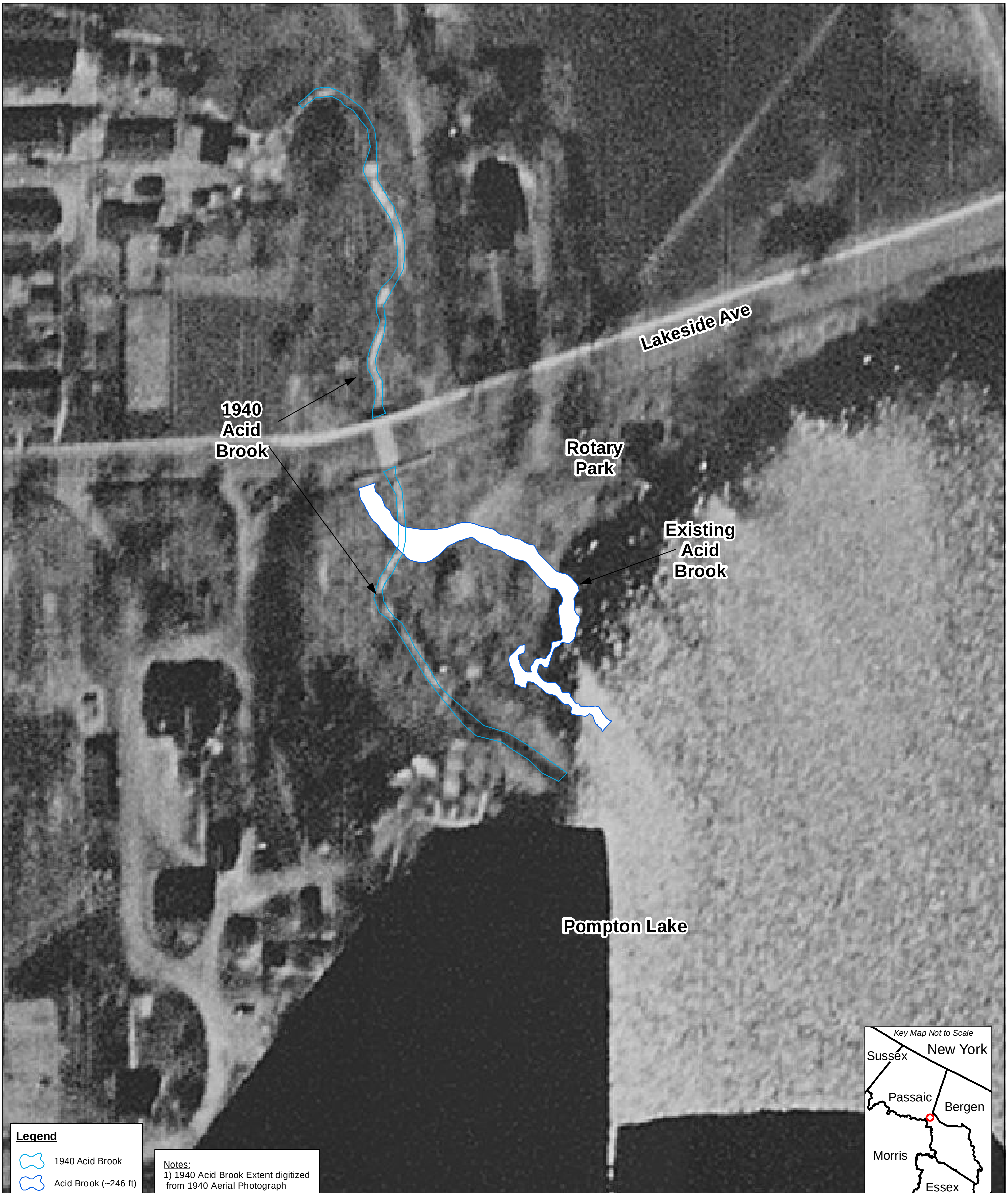
PRELIMINARY RESTORATION PLAN
ACID BROOK DELTA, DUPONT POMPTON LAKES WORKS
POMPTON LAKES, NEW JERSEY

TYPICAL RESTORATION
CROSS-SECTIONS AND ELEVATIONS

JOB NO. 18985155.00010	SCALE: AS NOTED
SHEET	FILE No.
DRAWING NO. 2-10	REV



Legend

1940 Acid Brook

Acid Brook (~246 ft)

Notes:
1) 1940 Acid Brook Extent digitized from 1940 Aerial Photograph

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DUPONT POMPTON LAKES WORKS

PROJECT NO. 18985912

0 50 100 200 Feet

1 inch = 100 feet

Figure 2-11
1940 Alignment of Acid Brook Channel
DuPont Pompton Lakes Works
Pompton Lakes, New Jersey

Source:
1940 Aerial Photograph
URS Custom Data

Q:\GIS_Data\DUPONT\PMPTNLKS\Projects\RAWP\Figure 2-11 1940 Acid Brook - new.mxd